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MEDICINA NAUTICA.

VOL. II.

a. L. 21-22

Collegii *Regii*
Medicor. *Edinburgensi*

Medicina Nautica:
AN
E S S A Y
ON
THE DISEASES OF SEAMEN:

WITH
AN APPENDIX,
CONTAINING
COMMUNICATIONS ON THE NEW DOCTRINE
OF CONTAGION AND YELLOW FEVER,
BY AMERICAN PHYSICIANS;
TRANSMITTED TO THE ADMIRALTY BY SIR JOHN TEMPLE,
BART, HIS MAJESTY'S CONSUL-GENERAL.

A. L. 21-22

VOL. II.

BY THOMAS TROTTER, M. D.
MEMBER OF THE ROYAL MEDICAL SOCIETY,
HONORARY MEMBER OF THE ROYAL PHYSICAL AND OTHER LITERARY
SOCIETIES OF EDINBURGH,
AND PHYSICIAN TO HIS MAJESTY'S FLEET.

QUALIS AB INCEPTO.

L O N D O N :
PRINTED FOR T. N. LONGMAN AND O. REES, NO. 39, PATERNOSTER-ROW;
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1799.

TO

GEORGE JOHN EARL SPENCER, K. G.

FIRST LORD OF THE ADMIRALTY, &c.

MY LORD,

I BEG leave, with due submission, to recommend this Volume of *MEDICINA NAUTICA* to your Lordship's protection.

While, by a wise distribution of the naval force of GREAT BRITAIN, and by prompt and efficacious measures, You have enabled her Fleets to achieve victories, and

a

perform

perform prodigies of valour unrivalled in the history of nations, the independence of Europe has been sustained, and a prospect opened for the restoration of tranquillity to the civilized world.

The health of men who have thus wrought the deliverance of Society, cannot be a secondary consideration with an English Statesman. But the subject is of that nature, that it must engage unre-mitted attention, lest its practical duties should relax into mere forms of office. The acquirements of Science may dazzle, and the attendance of the Medical Profession may amuse mankind; but if Disease fail to interest the heart and the benevolent affections, they become insulters of human affliction, and “*mock defrauders of the tomb.*” The Vote of Seamen for the service of the current year has been one hundred and twenty thousand. Of this number many must die from the common maladies of
life;

life ; many from the fate of battle ; but more from the severe vicissitudes of climate and season, and the unavoidable hardships incident to their employment. Unrestrained by order, and regardless of punishment, they are heedless, turbulent, ferocious, and revengeful : but controlled by discipline, under the authority and address of intelligent Officers, they are generous, patient, courageous, and invincible. Their most fatal Diseases are peculiar to themselves ; from habit they are regardless of health, and must therefore, of necessity, be watched like children, as little can be expected from their own discretion. These singularities of character offer the greater scope for the exercise of every tender feeling, in the Minister, the Officer, and Medical Attendant, as it must be deemed the more noble, disinterested, and sincere, when bestowed on men who cannot appreciate the motive. How con-

soling then must it be to *those* dignified Commanders who have patronized so many improvements, whose countenance has cheered our labours, and whose good wishes still keep pace with these exertions !

In the high office which Your Lordship has filled with distinguished ability, to the advantage of this Country and the interests of Europe, the splendor of station, and the power of patronage, may have their due value. But to a Christian Statesman, and an enlightened mind, it affords richer gratifications. Your naval administration has been renowned by a series of victories ; and the satisfaction which you have felt, in announcing them to the Nation, could only be equalled by condescending, with a Board of Admiralty, to visit the Hospital-Ship of the Fleet, and every Ward in Hallar Hospital, for the purpose of extending the comforts of the Sick. In the one
case

case You performed the duties of office ; but the example of the other was from a higher model.

As the confidence of the SOVEREIGN, and the suffrage of the Country, will probably long retain you at the head of the ADMIRALTY, we gladly hope the improvements in this Department will be progressive ; and to this You will be encouraged by the advancement which Medical Science is making under your auspices. I trust that the present Volume will give a favorable idea of the abilities and exertions of Naval Surgeons ; and that the means taken for promoting inquiry have not altogether failed. It contains matter important from its practical nature, and which has prematurely drawn it before the public eye. The subject of Contagion is resumed ; and our opinions are now supported by doctrines taught in another Hemisphere ; in which a bold and masterly induction of Chemical Philosophy has

has given birth to very new ideas, and expelled from untenable ground an host of ancient prejudices.

I have the honour to be,

MY LORD,

Your Lordship's

Faithful humble Servant,

T. TROTTER.

SPITHEAD,
December 30, 1798.

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MEDICINA NAUTICA.

INTRODUCTION.

WHEN the former volume of this work was laid before the Public, we had small expectations, from the general hopes of peace, that we should soon find ourselves in possession of materials sufficient for a second. But much of our present matter has been deemed of such importance, that it would have been improper to delay the publication any longer. We allude particularly to the papers that have been sent to us from America.

We are neither too much elated with the success of our past labours, or afraid of the fate of our present, to see any necessity for altering the plan of our undertaking. The naval service during war has always held out an ample field for observation; but the reapers have not been many, and the gleaners but few. There are also few inducements to engage a man to study amidst the tumult and bustle of a sea-life. The mind ought to be secure of its tranquillity, when it gives full scope to its reflections; and the sight of an enemy, or the approach of a gale of wind, are

so many interruptions to a train of thought, that it requires a degree of apathy, not often met with in the literary character, to rally at pleasure. The world must therefore accept our present labours in the homely dress we are enabled to give them. The ship in which we embarked during the summer did not return to Spithead till the end of November, at which time we began to compile this volume: to spend eight months of the year at sea, and the remaining four in severe study, is what our health and spirits are unequal to perform.

The original plan of arrangement is preserved: a short history of the health of the fleet is premised, which, from the small number of ships employed, offers but little occasion for remark. Some of the subjects of the former volume are resumed, where there was a necessity for a fuller examination, or by the accession of fresh facts. In the department of surgery, we have brought forward matter of investigation, alike new and interesting; and we have given the name of malignant ulcer to a species of sore that has infested some particular ships in a manner that has excited strong suspicions of a contagious nature. This inquiry being now begun, we earnestly hope that attentive observers will not fail to preserve every fact that may tend to elucidate this hitherto unexplored subject. A few surgical cases are introduced, which do equal honour to the Profession, as to the gentlemen who have so ably and successfully managed the cure.

On

On the whole, we trust the contents of this volume will be an acquisition of some valuable facts to the science of medicine; and also a very favourable specimen of the medical character in this department of the public service. The numerous testimonies of friendship and regard which these communications have conveyed to us, as they surpass all our expectations, so they transcend our capacity for offering thanks. We must consider ourselves fortunate indeed, to be placed in a situation where our own studies called forth such encomiums, and where we have had the opportunity of encouraging those of others.

In the Appendix we have inserted a number of American communications on Contagion and the Fever which has lately made such devastations in that country. They are entirely connected with our inquiries, and must go a great length in bringing them to a conclusion. We will not anticipate the opinion which our readers must entertain, on some prevailing modes of practice, when they peruse these able disquisitions.

MEDICAL LIBRARY.

We now wish to call the attention of medical gentlemen in the Navy to a subject which we barely hinted at before—the establishment of a Public Library, for books on Medicine, and its

collateral sciences, at the Royal Hospitals of Haslar and Plymouth. We must here speak as we have felt, from experience. The necessary books which every physician and surgeon must peruse, in order that his knowledge may keep pace with the improvements of his profession, are not only numerous but expensive; a great part of them are beyond the reach of an individual; and, besides, the apartments allotted for these officers in a ship put it out of their power to carry any considerable quantity with them. It must be obvious then to every one, that some establishment of this kind is highly practicable; and we shall briefly state our plan.

On the part of Government, let one of the corner rooms of Haslar be granted for the purpose, and also 40*l.* per annum, with the house provisions, and a cabin, be allowed to some person to act as keeper. The physicians to fleets, physicians and surgeons of hospitals, and surgeons of the navy, shall allow the sum of five shillings, when actually employed, out of their annual pay, for the purchase of books; and only these gentlemen shall have admission to the library. It shall be open every day in the week for eight hours.

The physicians to fleets, physicians and surgeons to hospitals, surgeon to the flag-ship of the commander in chief at the port, and the two senior surgeons for the time being, shall be a committee to transact the whole business of the library.

The commissioners of the navy shall deduct five shillings from the annual pay, which sum shall

shall be subject to the disposal of the committee at their quarterly meeting.

Some of the periodical publications shall be taken out, and lie on the table of the library. No member shall be allowed to carry a book out of the room.

The arrangement of such a business, on these premises, would surely not be very difficult; and we cannot doubt that such a plan would meet the approbation of the Lords of Admiralty, and every Board connected with naval service.

Should such an establishment meet with that support it appears to merit, the author will most cheerfully contribute the whole of the medical books he has accumulated during the war.

CLINICAL LECTURES.

A short time before I left Haslar Hospital, I had projected a plan of a Clinical Ward, after the model of the Royal Infirmary at Edinburgh. It was intended to select from the patients in the north wing, which contained the wards belonging to me, such cases as might afford matter for animadversion, or particular modes of treatment. It was also intended, that a large book, in which was to be registered the history of every case, with the appropriate method of cure, should lie on the table, and be open to the

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inspection

inspection of every medical gentleman belonging to the building, and also to the surgeons and surgeons' mates of the navy, who might visit the ward occasionally. I had made a beginning in this business at the time I was promoted to the fleet; the manner in which it was conducted, afforded much satisfaction to the young men attending my patients, who met me in the Clinical Ward at a regular hour after the business of the morning. Once a week, or once a fortnight, a summary of our cases would have made the subject of a lecture to be carried on throughout the winter, according to the usual form of such institutions.

We take the liberty of mentioning this, as it will be generally admitted that the naval hospitals are, of all others, the best suited for an establishment of this kind, in surgery as well as physic; and I leave it to those who are most competent to decide, whether the public service would not derive uncalculable advantage, by converting them into a seminary of education for navy surgeons. To give this plan due support, it would be necessary for Government to allow a certain sum to the physician and surgeon who undertake the respective Clinical Wards and Lectures. The Operation-room in the centre of the building at Haslar is already commodiously fitted for a large audience.

At a General Meeting of the Surgeons of his Majesty's Ships at the Cape of Good Hope, assembled for the purpose *,

It was unanimously resolved,

That a gold snuff-box be presented to Dr. Thomas Trotter, physician to the fleet, in testimony of professional abilities successfully directed to the welfare of the British navy: and in gratitude for long and unwearied exertions in behalf of the surgeons; and that Mr. M'Callum be requested to present the same in the name of this meeting.

“ S I R, Cape of Good Hope, June 1, 1797.

“ The real happiness which I feel in communicating to you the deep sense of gratitude and esteem

* (Signed,)

Mr. Shaw,	Tremendous.
Mr. Bury,	Sceptre.
Mr. Motherwell,	Jupiter.
Mr. Goldsmith,	Trusty.
Mr. Fullerton,	L'Oiseau.
Mr. Anderfon,	Crescent.
Mr. Gallahar,	Vindictive.
Mr. Thompson,	Rattlesnake.
Mr. Rowlands,	Star.
Mr. Haines, (lately)	America.
Dr. Pattison, }	Naval Hospital.
Dr. Wilson, }	
Mr. Fletcher,	Tromp.
Mr. M'Callum, (lately)	Tremendous.
Mr. Lind,	Saldanha.

of the surgeons of the little squadron now on this station, for your able, unwearied, and in some measure successful exertions to promote the general interests of the British navy; but particularly that department of it with which they are more immediately connected; can only be exceeded by that, which I am sure you will more sensibly feel, on receiving so public, honorable, and marked a testimonial of it. At a meeting purposely held to take this subject into consideration, it was unanimously agreed to present you with a gold snuff-box: and in the name of the meeting, I am directed to beg your acceptance of it, as a token of that sense of obligation to you, with which they are strongly impressed.

“ With the most heartfelt satisfaction they have already observed a considerable improvement in the medical department, and in their hitherto neglected situation. To your unceasing labours in their behalf they are ready to ascribe a great share of it; and to you they offer their unfeigned acknowledgments. Looking forward with confidence, from what has already been done; and relying on your persevering exertions, of the continuance of which they gladly perceive an implied promise in your late publication, they do not despair of seeing the plan of improvement you have pointed out ultimately crowned with complete success. That you may long continue at the head of that department, where you have been so deservedly placed as the reward of industry and merit; and that you may, as heretofore,

fore, both by your example and precept, continue to infuse and disseminate among the navy surgeons that laudable spirit of inquiry to promote the interests of medical science, by a chaste and faithful collection of facts, is the sincere and ardent wish of those, in whose name this letter is written, and of him who is most truly yours,

“ GEORGE M'CALLUM.

“ TO DR. TROTTER.”

A N S W E R.

“ S I R,

Portsmouth, Feb. 11, 1798.

“ I have been favored with your letter of the 1st of June last, inclosing a resolution of the surgeons of his Majesty's ships at the Cape of Good Hope; and also the elegant present that accompanied it.

“ It is no small satisfaction to me to find, that the fruit of my professional studies has been favorably received by so respectable a part of the list of navy surgeons on a remote station: and this testimony of their regard shall be preserved in everlasting remembrance.

“ But while I receive with the utmost sense of gratitude the assurance of estimation which their gift is meant to commemorate, I must beg leave to observe, that in any exertions of mine which the surgeons may please to think to have benefited their establishment, I have been barely doing my duty; for the public service can never be sufficiently

ciently secured, till men of superior abilities in science are duly rewarded. It may be thought that medical men occupy but an insignificant place, and fill but a trifling employment in the great scale of national business. But the complete prevention and easy extinction of some diseases *, that on former occasions baffled all naval operations, demonstrate this to be a mistake; and which, joined with the matchless discipline of our officers, at a momentous crisis, proclaim in emphatic terms to astonished Europe, that *it is natural for an Englishman to live at sea.*

“ Accept my best thanks for the delicate and friendly manner in which you have communicated this information; and believe me most sincerely yours,

“ T. TROTTER.

“ To GEORGE M‘CALLUM, Esq.”

* Scurvy and Contagion.



MEDICINA NAUTICA.

GENERAL ABSTRACT

OF THE

STATE OF HEALTH IN THE FLEET,

FOR THE YEARS 1797 AND 1798.

Conclusion of 1796.

December 18.

ARRIVED in port, the Fame and Juste, from sea, having left Admiral Colpoys off Ushant. The latter ship had been fourteen weeks out, yet not a single man was sent to the hospital. Mr. Kenning, in his report, says: "The health of our ship's company has been uncommonly good, considering the length of the cruise. In the course of the last eight months we have spent seven at sea, consequently the people are much exhausted, and stand much in need of nourishment and vegetable refreshments. Twenty cases of scurvy occurred in this month, but were all cured on board."

The frigates stationed on the coast of France, at the isle of Marcou, and blocking up the port of

Havre, usually returned to Spithead, over-run with scurvy, from the length of their cruizes. At this time, however, it appears, that the disease is scarcely known, even in cruizes of ten and twelve weeks; counteracted, as the officers report, by the large allowance of vegetables now supplied when they return to port.

The *Medusa*, a 50-gun ship, having been fitted at Plymouth as an hospital-ship to attend the fleet, I have been directed by the Lords Commissioners of Admiralty to take up my residence on board as soon as she arrives at Spithead.

In the mean time, at my request, their Lordships have been pleased to order the same *improved diet* to be supplied as was customary in the *Charon*, with the addition of a milch cow, which may be considered the last article of comfort that we can suggest as practicable to be carried to sea: this gave all we could wish, without any unnecessary refinement.

The frost set severely in about the beginning of this month; a fall of snow happened on the 23d, and a thaw on the 29th.

December 31st. Arrived a Squadron under Vice-Admiral Colpoys, having been cruising off Ushant for twelve weeks.

The good health which these ships enjoyed for so long a time, during the most inclement season of the year, affords another and most decisive testimony in favour of the preventive plan, and what may be effected by proper discipline. I shall here
insert

insert a letter from Mr. Smith, surgeon of the London, the flag-ship; and another from Mr. Kent of the Marlborough.

“SIR,

Spithead, Jan. 1, 1797.

“It gives me great satisfaction to acquaint you with the very healthy state of the ship’s company, during our very long cruize in the winter season.

“We sailed from Spithead the 15th of October, and arrived the 31st of December, being eleven weeks and two days. During the first eight weeks we had rather pleasant weather, dry but cold, as the wind all that time was to the northward and eastward; or westward of South, with thick hazy weather, often rain, and strong gales.

“As to our diseases, they were few; some catarrhs, with pleuritic stiches, which sometimes required V. S. and blister. Towards the end of the cruize, some few coughs, with slight febrile symptoms. A few venereal cases became troublesome, from the cold weather unexpectedly directing the mercury to the gums or bowels.

“The lemon-juice and sugar was issued daily, and care taken that it should last the cruize; the utility of these, together with the molasses, completely secured us all the time from a single symptom of scurvy.”

“ S I R,

Marlborough, Jan. 4, 1798.

“ I beg leave to inform you that we failed from Spithead the middle of last June, since which we have been only ten days at anchor in Cawfand Bay, and four in Torbay. We got a supply of eight weeks lemon-juice and sugar from the Powerful, which, I am confident, preserved the Marlborough healthy, having for six months never more than twelve in our list, frequently only two. Such facts as these shew the necessity of supplying fleets at sea with refreshments. Our people then looked florid and healthy; but though they are still in good spirits, yet they are much exhausted in strength, and their fallow looks denote a want of fresh animal food and vegetables, which they now partake. We brought in only two scorbutics: no objects for hospital.”

A fever in this cruize prevailed on board the Powerful. Mr. Collins remarks that twenty cases occurred in October; in November only seven cases; towards the end of December and beginning of January he had sixty-eight cases. The increase latterly he justly attributes to wet decks, confined air, the scuttles being shut, and the decks leaking above, during stormy weather. At this time also a dysentery was associated with the fever, and, no doubt, owing to the causes just mentioned. And I do not find from Mr. Collins's report that he suspected any imported contagion: but he adds,
“ On

“ On our arrival in port, I sent all the fevers
 “ (seventeen) and the only remaining (three)
 “ fluxes to the hospital; and continued to send
 “ all of the typhoid class, as soon as they com-
 “ plained, in order to get the ship clear from the
 “ *contagion*.” He makes no particular mention
 of the symptoms; but, in the only fatal case, there
 was a singular constriction about the fauces. The
 treatment was such as we usually approve.

He concludes, “ We were nearly fifteen weeks
 “ at sea, without any supply of vegetables; yet
 “ we arrived without a single scorbutic patient in
 “ the list, which evidently shews the utility of
 “ lemon-juice and sugar; and by their aid I was
 “ enabled to cure some bad ulcers.”

It was remarked in page 160 of *Med. Naut.*
 that a contagious fever had appeared in the *Glory*,
 a very short time before she failed. There have
 been no fresh cases since that period. Ten bad
 scorbutic ulcers were cured at sea, which formed
 the sick list during this cruise. When the *Glory*
 left Spithead, the *bilge-water* was observed to be
 remarkably offensive: but, after being some time
 at sea, this disappeared; and, probably from the
 motion and agitation of the ship, was at last very
 pure and sweet.

The *Queen Charlotte* carried to sea the small-
 pox contagion, which appeared very soon after
 leaving port. Mr. Caird traced it in the first case
 to Haslar Hospital. Eight patients were infected,
 and by great attention and separation was subdued
 at last. One boy died.

1797.

January 3d. Sailed from St. Helen's a squadron for the purpose of intercepting a French fleet with an army on board, that sailed with the intention of invading Ireland.

February 3d. The squadron returned to Spithead, in good health, without meeting the French fleet.

The surgeons of the fleet at this time were served with a new code of instructions from the Board of Sick and Wounded, which now had the appointment of surgeons and mates throughout the navy. We observe, among some alterations, a very complicated form of journal; and what is rather singular, a weekly account is required to be sent every opportunity to the Board: the use of *nitrous gas* is also directed to be used to destroy contagion when it appears in his Majesty's ships.

March 1st. Sailed sixteen sail of the line.

March 30th. Sixteen sail of the line returned from sea, generally in good health.

At this time there were forty sail of the line in the Channel, or Channel Ports; the number of physician's patients at Haslar amounted to four hundred! What town or village can produce such health as this?

Some

Some severe catarrhal complaints occurred during this cruize in March. For the last three weeks there prevailed heavy gales of wind, very cold weather, and much rain, for days together. The decks, in consequence, were flooded with water. Mr. Smith of the London remarks, with his usual accuracy, “ that fluxes appeared immediately among the marines, from being lodged in a more exposed part of the ship; and from wearing thin linen trowsers, when they ought to have had thick woollen ones.”

I am now glad to find that thick cloth trowsers and jackets are, in future, to be issued to marines, as has been long the practice to seamen.

April 1st. During the last month a slight typhus appeared in the Minotaur, which extended to fifty cases, and which Mr. Bell treated successfully on board.

9th. This day Admiral Earl Howe, K. G. resigned the command of the fleet.

His lordship for the last two years had been afflicted with severe attacks of gout, attonic and irregular, which were followed with much debility, approaching to a paralysis of the lower extremities; and to be traced to a circumstance that came within my own knowledge.

While the fleet, consisting of thirty-four sail of the line and sixteen frigates, lay in Torbay in February 1795, there happened a heavy gale of wind at S. E. which blows right into the bay. The danger

danger to which the fleet was exposed is inconceivable: the swell of the sea was tremendous; many of the ships were driven into shallow water, and some parted their cables: the weather was very cold, with snow and sleet falling. This happened in the morning early; but the wind gradually drew to the eastward, till it came off shore, and about ten o'clock it was moderate.

During this time, his lordship had exposed himself too freely to the cold: but it is probable, that the anxiety of mind inseparable from so trying an occasion to a commander in chief, the enemy's fleet being at sea, was the principal cause of inducing a state of *attonic* gout. He was observed to be lame in walking in to breakfast next morning: his confinement afterwards was tedious and painful, which was borne with patience and fortitude peculiar to himself.

Thus retired from active service, an officer, who has been the ornament of the nautical profession and the British navy during a long life, and who will be the admiration of posterity. While it falls to the province of the historian to appreciate the numerous improvements which Earl Howe has introduced into naval tactics, in the particular disposition of the ships of his fleet, and his general method of manœuvring them, these pages will testify how much the health of the navy, and the comfort of the sick, are indebted to his attention. Under his authority the subject has assumed a new aspect; and changes have been effected of such magnitude and general utility, that if the same spirit

spirit be preserved in future armaments, projected operations are not likely to be defeated by the ravages of disease. With this good and great man the health and comfort of the people were his first objects: in the exercise of my official duty, I was commanded to make use of his name, on every occasion; and in all my interviews with him for that purpose, I never came away disappointed*.

May 1st. The Medusa hospital-ship joined the fleet at St. Helens, now complete in every thing that I could devise, for the comfort of the sick.

* As we may not have occasion again to mention the victory of the first of June, we must beg leave to contradict the statement of some occurrences on that day, relative to the sinking of the Vengeur. It was said that the Frenchmen who went down in this ship, as long as their heads were above water, continued to cry aloud, "Vive la Re-publique!" and with this expression in their mouths sunk to the bottom. Somehow or other this account got into the English newspapers, and soon reached France. But the whole is a falsehood; and I have it from the authority of the officers who attended to save the people, and saw the dismal catastrophe. The scene presented a very different spectacle; all was horror and dismay, and no such words were ever uttered. Barrere in the Convention made a fine text of it, in expatiating on the *naval victory* of Jean Bon St. Andre; votive tablets were immediately decreed to the manes of the sufferers, and a three-decker ordered to be built and called Le Vengeur. But things are strangely altered since: the orator himself has been semi-exiled; Jean Bon St. Andre is now a prisoner in the Seven Towers; and poor Villaret, the brave admiral, is reaping his laurels on the burning plains of Cayenne!

About this time I was favoured with an account of a contagious fever that had prevailed for some weeks on board La Nymphe frigate. This ship, in company with the St. Fiorenzo, took, in the entrance to Brest, two French frigates returning from Fishguard in Wales, where they had landed one thousand soldiers all convicts, and from the prisoners it was thought this fever was conveyed to the crew of La Nymphe. It first appeared in two men who had been in one of the prizes, and soon extended itself to others. The prisoners were landed at Plymouth, where Dr. Harris, who attended the prison, told me a considerable number of them died, and it was some months before the contagion was completely overcome. To the Plymouth hospital seventeen of La Nymphe's people were sent: this was about the end of March: she sailed for Spithead; some were recovered on board, and one man died on the passage.

Mr. Outram observed nothing particular in the symptoms of this fever. He employed the nitrous fumigation of Dr. J. C. Smyth, as directed by the Commissioners of Sick and Wounded in their instructions to the surgeons. This process, however, was interrupted by *occurrences* in the ship, and certainly was not properly practised, if it had possessed the power of destroying contagion. It, therefore, continued to spread, and numbers were sent to Haslar. Mr. Outram left La Nymphe at this time. His successor did not join her till two months afterwards, who found the fever still prevailing, and it was the beginning of September before

before it was completely extirpated : but more of this hereafter.

The contagion in *La Nymphe* was imported to the *Defiance* by a boat's-crew, who slept a night on board during a gale of wind that prevented them from returning to their own ship. The nature of it was very soon detected by Mr. Glegg, and from the attention that was paid to the subject by Captain Jones and his officers, it was overcome in due time, without extending far. The means used on this occasion were the same as those so often detailed in this work, and nothing more than the usual routine of duty in a well-disciplined ship.

4th. The fleet, consisting of nineteen ships of the line, are at this time in good health : but the deficiencies of complement have lately been filled up with indifferent landmen, raised by the towns and counties.

A quantity of sheep, porter, and cyder, were at this time distributed to the ships of the line.

6th. Having recommended a trial of the nitric acid in the treatment of lues venerea, as directed by Mr. Scott of Bombay, in a late publication by Dr. Beddoes, I was at this time shewn some cases by Dr. Browne, of the Royal Sovereign, where this remedy was tried. This subject is mentioned in a future part.

Dr. Browne had at this time also some patients with obstinate ulcers, which were healing under a

new mode of dressing, as published by Mr. Bayntun, surgeon in Bristol. It consists in bringing the edges of the fore as near one another, by slips of plaster and bandage, as the nature of the parts will admit: the bandage is to be kept wet by the frequent sprinkling of cold water. Relief from pain, and the free use of the limb, were the almost immediate effect of this practice; the ulcer assumed a lively hue, and closed rapidly. It was surprising to see men, with ulcers on the legs of very considerable dimensions, walking about with ease, that a few days before were confined to bed. This method has been successfully imitated by many of our surgeons, to the vast relief of the seamen, and benefit of the service. It is plain that the practice here recommended cannot be extended to all kinds of ulcers; but certainly surgeons have not sufficiently availed themselves hitherto in keeping the edges of old sores as much in contact as may be.

17th. The fleet sailed from St. Helen's.

21st. Five men in typhus were sent from *La Nymphe* to the *Medusa*. This ship had now sent eighty men to hospitals since the middle of March, when the fever first appeared.

During this month there was much fine weather, and also some strong gales of wind.

June 10th. The sick of the fleet were this day sent on board the hospital-ship, to the number of sixty-five in all. Some bad cases of malignant
ulcer

ulcer had been sent on board before this time. The other diseases were chiefly pulmonic complaints.

The ships particularly affected with these ulcers were, the Queen Charlotte, Royal Sovereign, Saturn, and Terrible. These ulcers had nothing of the scorbutic appearance, but were rather granulated and florid on the surface, when not covered with sloughs. Some of them began from blood-letting, others from blistering, many from slight scratches and bruises and burns; but most began from a small pimple, of a livid colour, that quickly inflamed and spread, accompanied with symptoms of fever, often delirium, and intolerable pain. The speedy conversion into gangrene and sphacelus exceeded every thing I had ever witnessed in surgery; for often, in the short space of a day or two, the whole integuments and muscles of the limb seemed to drop away; and a caries of the bone often followed. In some cases buboes became very distressing, from the absorption of the matter.

During this cruize a typhus appeared in La Pique frigate; and some cases of it were sent to the Medusa. Mr. McDonald traced the contagion to the Royal William, by a draft of fifty-five raw landmen at the time she came out of harbour. Early attention on the part of the officers and surgeon soon subdued it; and it did not affect any of the old standers in La Pique.

“ On my appointment to this ship in March last,
“ I found her in a very healthy state ; two were

“ afflicted with chronic rheumatism, and two or
“ three had catarrhal complaints, not confining
“ any of them to bed. We continued in Portf-
“ mouth harbour for two months (during which
“ time the ship was undergoing a repair). We
“ sailed to Spithead very short of complement ;
“ but it was made up by a draft of fifty-five land-
“ men from the Royal William, and very badly
“ clothed. Two of these men were seized with
“ symptoms the second day after being on board.
“ As soon as the nature of the fever was detected,
“ they were sent to Haslar, on the fourth day of
“ of their illness. Petechiæ, delirium, a black
“ tongue, great muscular debility, with nervous
“ symptoms, exhibited themselves. Three more
“ were seized at sea with the same sort of fever in
“ a very bad way, and several in a mild way. One
“ of the bad cases died on board the thirteenth day
“ of his illness ; the other two were sent on
“ board the Medusa : *none* of the old hands were
“ infected.

“ Our chief prophylactics were, a timely sepa-
“ ration on the attack ; their bodies were well
“ washed with soap and water, sick bedding sup-
“ plied them, constant fires in the sick birth, and
“ between decks, free ventilation by windsails night
“ and day, frequent scrubbing with warm vinegar,
“ and their own bedding was scoured and well
“ aired.

“ W. M'DONALD, Surgeon.

“ *La Pique, July.*”

Twenty-one cases were infected in all.

14th. The hospital ship left the fleet off Plymouth.

15th. Arrived at Spithead, and landed the sick : the weather fine.

July 8th. Having completed our stores and necessaries, sailed from St. Helen's to join the fleet.

12th. Joined the fleet in Torbay.

The scurvy had appeared in most of the ships during the cruize, but cured with ease on board.

16th. Received the sick of the fleet, to the number of fifty-four, chiefly ulcers and pulmonic complaints.

17th. The fleet sailed, and also the Medusa with the above-mentioned sick on board. Some cases of syphilis were put on the nitrous acid since the 14th.

In some of the bad ulcers we observe that the free use of lemon juice has done harm, and has considerably added to the debility, when support was required. On the whole, none of our present cases are so bad as the former.

28th. Received the sick of the fleet, who, with the number on board, amount to eighty-seven.

Discharged

Discharged ten recovered men ; four of whom were cured by the nitric acid of lues venerea.— Parted from the fleet off Ushant at noon : this cruize fine weather.

29th. Arrived at Plymouth, and landed the sick.

Mr. Smith, of the London, remarks, that during the last cruize he had ten cases of typhus among landmen, who came from the receiving-ship at Spithead. In three the symptoms were severe, such as stupor and subsultus tendinum ; but they all recovered. One man in particular took no kind of sustenance but porter, of which he drank three or four quarts in the day, and did well.

Careful separation, in a cleanly and well-aired sick-birth, were the chief means used here to stop the infection.

August 5th. Received the hospital stores, and sixty sheep to be distributed.

6th. Joined the fleet, and distributed the necessaries, vegetables, stock, &c.

20th. This day a seaman's wife was brought from La Pique, in the eighth month of pregnancy, subject to constant hysterics, and incessant reachings and vomiting. She was allowed one of the nurse's cabins, with suitable attendants. These complaints had been of some weeks standing, but seemed to increase as the *uterus* extended ;
and

and she was now extremely miserable. The usual routine of medicines, opium, castor, asafætida, camphor, æther, &c. were tried in vain : lying on her back, with the pulvis somewhat elevated, was the only posture that gave any relief. Every thing in the way of diet was quickly thrown from her stomach, and she seldom slept. In this state she continued till the ship came to Torbay, where she had relations, and was delivered of a healthy child the morning after she landed : from this time all her complaints ceased.

22d. Received among others, a case of confluent small-pox from the Mars.—(*Vide article SMALL-POX*).

25th. The fleet returned to Torbay : at this time twenty-eight on board the Medusa.

It appears that few general diseases have been known during this cruize, except pectoral complaints : the ulcers of the malignant kind were happily cleared by the last number the Medusa carried to port ; and none of any consequence are now in the ships. The pulmonic affections are, however, very numerous, and chiefly to be imputed to the weather, which has been unusually cold for the season. Bleeding early, with other evacuations, was remarkably beneficial ; if delayed for a few days, it seemed in many cases to do harm, even when there were apparent symptoms of considerable excitement and stricture about the præcordia. Many of these cases terminated in

confirmed phthisis and hectic. Some of them were distinguished by pale countenances, low spirits, and constant sickness at stomach, with universal languor and debility. The stricture at the breast was frequently relieved by inhaling æther, as recommended by Dr. Pearson, of Birmingham; which was also given with success inwardly for the same symptom. The trials of inhaling the æther were, however, on too narrow a scale of practice for me to have troubled that respectable physician with a particular communication on the subject.

In these cases, where the inflammatory disposition was soon overcome, stimulants with wine were resorted to with much benefit: but the nourishing and delicate hospital diet was here, as in all afflicting circumstances, of the first importance. The milk and eggs enabled them to have a change of pudding, and sometimes a custard every day, ingredients rather new in sea-diet, but which were prepared with little difficulty.

In my general visit to the fleet at this time, there appeared an unusual despondency and dejection of spirits among the patients in the different sick berths. The outrageous fury of late proceedings had subsided; and the horror induced by some awful examples of punishment was now operating. When some of these cases were moved to the hospital-ship, we found not a few of them subject to very frequent fits of hysteria; and where this singular affection recurred with as much violence of convulsion as we have ever marked it in female habits, attended with globus, dysphagia,
immoderate

immoderate risibility, weeping, and delirium. The same sympathy seemed to extend from one to another, as is often met with in the fair sex ; three or four were sometimes in the fit at once ; and the propensity of being affected, by looking at others, became so common, that we were under the necessity of laying them at as great a distance from one another as possible.

I could not explain this extraordinary complaint among our patients in any other way, than resolving it to the effects the late tumults in the fleet had made on the feelings of the people. There were subject to these fits men of very different dispositions, as far as I could learn and judge of their characters. Some, whose mild and peaceable deportment appeared to have suffered from the alarm which a system of terror practised around them had produced ; and which had kept them in a state of constant dread and apprehension. But there were others, who had been active leaders in their ships, and the foremost in every outrage that was committed. The fear of punishment, if not remorse of conscience, acted here as a predisposing cause. On the whole, we had no reason to think that these men were playing tricks ; the reality was too apparent.

September 1st. No fresh cases of small-pox appeared in the Mars at this time, and she was considered safe.

2d. Stock, fruit, and vegetables, were distributed to the fleet for next cruise.

11th. A gale of wind from S. E. in which most of the ships parted their cables, but were brought up again without injury.

The sick on board the Medusa eighty-three, have suffered much from the motion of the ship during the late gales, by taking in water at the ports, &c.

24th. Hospital-ship ordered to Plymouth, provisions and necessaries being reduced to three days allowance.

25th. Arrived at Plymouth, by a fortunate flant of wind in the night, having failed with the wind against us: to have kept the sea long under such conditions of the sick, would have been miserable indeed. Landed the sick.

October 9th. Sailed from Plymouth, stored.

10th. Joined the fleet off Ushant, and distributed lemon-juice, vegetables, and surgeons necessaries to the ships, all of whom were in good health.

November 4th. Returned to Plymouth with a division of the fleet under Sir A. Gardner, with only twelve sick on board, ten of whom were landed, and two venereal cases taking nitric acid reserved, seemingly doing well.

18th. Arrived at Spithead, about which time the fleet came into port.

January

January 1st, 1798. The winter hitherto mild, and our ships in good health.

The occurrences of 1798 come chiefly under the heads of malignant ulcer and small-pox; but from the dismissal of the hospital-ship, a much larger number of sick have been sent to the hospitals than ever occurred before; more have died in their own ships, and a larger proportion invalided than in any summer during our attendance, although general diseases have been out of the question, the malignant ulcer excepted.

MEDICINA NAUTICA.

CONTAGION.

WE resume our subject.—In our former animadversions on contagion, we confined ourselves chiefly to what was of a practical nature, by laying open the various forms we had seen it assume, the manner of its propagation, the means of subduing it in the beginning, and of fortifying the human body against its influence. In all this we had little concern about accurate arrangement, as long as we were correct in stating facts : and as we had no theory to support, we were, therefore, little studious of method.

But although our labours have produced a larger mass of evidence on the infection of typhus, than most preceding writers had done, yet our practice was by no means such as has been generally adopted in the prevention and cure by other physicians. We were not, however, so confident in our abilities, as to suppose we should escape criticism, if not reprehension, while we endeavoured to overturn prejudices (for we cannot call them deductions from matter of fact,) that have from
time

time immemorial directed the means for destroying and purifying contagion.

When I came into the navy as a surgeon's-mate at Christmas 1778, I was a very young man, but had about me a little curiosity on professional subjects. At that time several ships had contagious fevers on board, derived from various sources, and the fumigating process was every where fashionable; so much so as to engross the sole attention of every person on board, as being certain in the issue. The Berwick of 74 guns, to which ship I belonged, previous to my joining her had been infected, though not badly: but in order to prevent contagion, and to purify the decks from unwholesome air, fumigations of different kinds were regularly performed once or twice a week: camphire, to a great amount, was sometimes the burnt-offering on these occasions. The infected ships, I observed, continued for months together under this operation; and many of my readers may remember the tainted hulls laying in remote corners of the harbour with the sulphurous fumes exhaling from their chinks every morning, for five or six months; and unfit for service. It was impossible to behold sights of this kind without some degree of concern; and they very naturally excited reflection. Infection appeared to me a very wonderful agent: what can it be? and how do the fumes of sulphur and explosions of gunpowder destroy it? These were queries I was constantly putting to myself, and asking others. No medical acquaintance round me, and no medical author that I could see

or hear of, could solve my difficulties. As for the fumigations, they all agreed that they were the most effectual purifiers; but none of them could explain the *modus operandi*: it was an ultimate fact. As I grew older, and as I thought wiser, I became more sceptical: till, without all reserve, at last, when I could meet with no explanation, I pronounced the whole to be downright empiricism; and experience and observation soon confirmed my unbelief.

It is easy to see how fumigations, and substances yielding strong perfumes, were first employed for this purpose. The plague, and other diseases attended with great mortality, in days of old, were looked upon as judgments commissioned by the hand of Divine vengeance to scourge the human race: hence sacrifices and expiations were made to the gods, to deprecate their wrath, and atone for the guilt of mankind. Sweet-smelling herbs and flowers, and aromatic gums, as myrrh and frankincense, made part of these ceremonies: and as the whole were of an agreeable flavour, and covered the offensive effluvia of diseased or corrupting bodies, it was natural, among nations unacquainted with chemical researches, to believe that these fumes, by changing the smell, corrected also the polluted atmosphere. Those diseases were observed to be the offspring of putrid and putrifying animal and vegetable substances: they saw such substances become a *nidus*, and the nourishment of numerous young insects, and concluded that this generation was spontaneous, because natural

tural history and experimental philosophy had not yet instructed them better. Animalcules, therefore, in such situations, in a warm climate, increase and multiply with wonderful rapidity, so as in some seasons to consume the whole vegetable productions of a country. To destroy these animalcules, which, now on the wing, they considered as polluting the atmosphere, brimstone and fire would quickly be resorted to; for it was known that no animal could approach their conflagration: and every article that yielded either pungent vapours, or agreeable odours, was thus called in to their assistance; hence the hyssop of the wall, the cedar of Lebanon, the camphire of Engedi, the spices of the merchant, the pitch of Norway, the tobacco of Virginia, &c. swell the antipestilential catalogue.

These substances that were employed for fumigation, it thus appears, have travelled down to us from the days of Greece and Rome, and the rites of the Jews, through the Arabian physicians, and the dark ages of Europe; and have retained their reputation and character amidst all the vicissitudes of human opinions, and the fleeting duration of medical theories. No one, till lately, had dared to question a practice sanctioned by the authority of antiquity, and the universal suffrage of modern physicians.

It required no prophetic knowledge to foresee that the beautiful discoveries of pneumatic chemistry would be soon enlisted under the banner of prophylactics against pestilential disorders; and

also be employed to account for the diseases themselves. The pneumatic doctrine explained to us, for the first time, the composition of elastic fluids. The sulphurous fumes had been long employed against infection; and analogy soon taught philosophers that the muriatic acid gas, and the nitrous gas, might be equally successful. The first was employed by the French physicians, the latter from the authority of Dr. Smyth; but it is said to have been recommended nine years ago by Dr. Johnston of Worcester. We do not find, however, that either the French physicians, or Dr. Smyth, have given us any accurate or satisfactory explanation of a contagious atmosphere; certainly none of their predecessors in fumigation have done it. Dr. Smyth, indeed, speaks of its origin in putridity; but that is nothing more than what was known to the rudest ancient; and we are yet unfurnished with any precise idea on the subject. Chemistry being a science of facts that leaves nothing to conjecture or sceptical reasoning, should have demonstrated the matter beyond a doubt: for the laws of attraction, as applied to the gases, are sufficiently plain; and it is rather unworthy of modern improvements to expel an elastic fluid from the alembic, and not be able to understand what combinations it may have formed after its departure, or to what state it returns. The theory of fumigation, therefore, either still leans to the animalcular doctrine, or it is practised by equally untenable authority, *servile imitation*.

In the month of January 1793, a typhus contagion appeared in one of the second rates, that was about to be paid off; and was afterwards carried by part of her crew on board the Valiant, a 74, commanded by Captain Pringle, now a Rear Admiral. I was at that time physician to the Royal Hospital at Haslar; and from having attended some of the cases sent on shore, before the distribution of the people, I could not help apprising the intelligent Commander of my opinion on the fever, and giving my advice what was best to be done. No copy of my letter was kept, for it was written on the spur of the moment: but I remember of having stated to Captain Pringle, with other particulars, that I had *no faith* in the fumigating process; and only said, if he was partial to it, to beware how he exposed his people to the weather above, while the hatches were shut to confine the vapour below. I mention this to show that my opposition to all unrespirable and noxious fumes had been decided long before the public Boards had given the preference to Dr. Smyth's corrector, and ordered it to be introduced into the navy. My appointment as physician to the fleet, shortly after this, under the command of the revered Admiral, that fully confided in my professional capacity, afforded me the free exercise of my opinions, and which led to that successful practice now before the public. The attention of every Officer in the fleet, and the suspicion of a few, was directed in watching the issue of our measures, at a period highly interesting to the

country, from a general contagion ; and they were not disappointed. Opinions, formed and matured in the manner these have been, cannot be easily controverted.

Having no personal acquaintance with Dr. J. C. Smyth, I could have no private resentments to gratify in opposing his doctrines. I admire his professional talents, and have a high opinion of the goodness of his heart ; for these are amply conspicuous in his writings. Few physicians have been more fortunate in their friendships than I have been ; and few have less reason to be jealous of others ; for my appointment took place under the Union flag of Great Britain, confessedly the highest medical station in the public service. In all my official engagements I have been loaded with every token of regard from the Officers and seamen ; and amidst all the changes it has been my duty to effect, I have, as might be expected, met with much asperity, but I hope, few enemies. With what justice then could it be surmised, that I opposed improvements, from motives not avowed ? Yet it is admitted immediately afterwards, that I had sufficient reason for preferring my own method of expelling infection. It would indeed have been hard to disprove that, for there was a healthy fleet at Spithead to demonstrate the fact. But the plain truth of the matter was, those physicians had previously committed themselves by looking upon the experiments of the nitrous gas in the Union, as full testimony in its favour. We conscientiously did our duty ; however our arguments may fail, *impar congressus*

congressus Achilli ; we conceived that trusting to fumigation in former times had often paralyzed the arm of war ; and we at this moment think, that the nitrous gas has, and is still doing harm, notwithstanding the certificates in its favour that are daily transmitted to the Board of Sick and Wounded *.

My letter to Mr. Nepean, on the subject of Dr. Smyth's pamphlet, was certainly never intended for publication at the time it was written. But being addressed to the Secretary of a public Board, and where there was some necessity of making the subject familiar to their Lordships, I did not find myself strictly confined to the rules of technical precision in language ; and therefore the chemistry of it has been found fault with. Since it was laid before the public, it has scarcely been treated with the candour which might have been extended to a hasty production, and compiled with all the hurry of official communication. We are, however, still disposed to defend the practice as there delivered ; for we think, from recent experience, it is sufficiently correct.

* Very shortly after my circular letter was sent to the Surgeons, a letter from Mr. D. Patterson to the Board, in a printed form, was distributed from the flag-ship to the Captains. The following paragraph is twice or thrice repeated :
 “ Nitrous vapour may not only be considered the *most convenient*, the *most elegant*, and the *most ingenious*, but also the *most efficacious remedy*, for the purpose of counteracting different species of contagion, that has yet been offered to the public.” *Ab uno disce omnes.*

The small publication, containing the account of experiments made on board the Union hospital-ship, with a view to ascertain the effects of nitrous gas in destroying contagion, was first put into my hands by a physician now attending a Squadron of his Majesty's ships on a foreign station. That gentleman, like many others, was surprised at the doubts I expressed on the subject; for he, like them, looked upon the narrative as demonstrative evidence. And I trust it will be now made appear, that the experiments themselves by no means carry that conviction.

We are there informed, that Mr. Menzies arrived at Sheerness on the 24th of November, provided with the necessary ingredients and utensils for diffusing the nitrous gas in the wards of the Union hospital-ship. He prefaces his experiments with some general remarks on the malignant fever then prevailing, and the condition of the wards. He wisely recommended some beneficial changes in these apartments; and some of his observations there, for the credit of service, we wish never to have been laid before the public. The wards, it appears, had begun to be occupied by the infected Russians *early* in September. This was nearly three months before, during which time ten women were seized with the fever, three of whom died; and twenty-four of the ship's company, of whom three died. It is very natural to ask, how these thirty-four people were affected by the contagion more than the rest of the ship's company; and the reason is obvious: they had that *predisposition* that
invites

invites infection, if I may so speak, and the greater part of them were immediate attendants on the sick. Now it is easily to be discovered, by persons accustomed to investigate circumstances which uniformly accompany all general infections, that the patients first taken ill were either more exposed to the contagion, or people of sad and timid dispositions, full of apprehension, and at that period of life, from fifteen to thirty-five, that is especially liable to febrile affections. The debility that succeeds to ebriety gives also a strong pre-disposition; and we see how earnestly Dr. Smyth and his co-adjutors adduce this, as pre-disposing a marine who was infected after the diffusion of the gas; although there is not a word of the kind in all the other instances of fever that had, previously to this period, taken place among the women and men. Now we insist, that the uninfected remainder of the ship's company must have been saved by keeping at a distance; or they must have been habits of body different in condition from what is mentioned above; and these reasons are sufficient to account for their exemption, and solve the problem completely. This fever had now been three months in the Union hospital-ship, and probably much longer on board the Russian men of war; it was therefore arrived at that good old age, which we call decline, and when it must soon die a natural death. And there can be no doubt but it was prolonged in the Russian ships, by going again to sea before being cleared, as immediate separation was then out of their power. Every person who
had

had the pre-disposition about them that favours the reception of contagion, must in so long a time have suffered an attack; those who possess this pre-disposition in its most exquisite degree would be first taken ill; next would follow those who had it in a lesser degree, and so on till its progress was arrested by meeting with habits that resisted its influence, and that could by custom breathe a contagious atmosphere with impunity.

We thus see that it is not a correct method of canvassing evidence, during the rage of a prevailing fever, on the validity of any prophylactics, if their use had been begun at a period when the infection is supposed to be naturally on the decline; and when it has exhausted the subjects or constitutions which it more easily affects. Such, from the evidence produced by Dr. Smyth, we contend to have been the case on board the *Union*, when Mr. Menzies began his experiments.

These animadversions apply exactly to the extinction of the fever in the Russian ships. Some few cases, it would appear, had been sent to the *Union*, about the beginning of January; these could not be very ill; for on the 3d of February Mr. Baffan informs Dr. Smyth, it was totally extinct. We also see that there were little sickness in any of them at the time Mr. Menzies returned to London about the end of December: he speaks particularly of the offensive smell from the *shubs* or great coats. On the whole, it is clear that this contagion was on the decline *by nature*, when the nitrous fumigations were begun in the *Union*, and
nearly

nearly extinct in the last Russian ship before it was tried, but in all the others had previously disappeared. There was indeed full time for any contagion to have ceased (for it had prevailed for four months), even if the advantage of moving the infected to the Union had not been duly directed, and had not aided the extinction.

Let us now examine the account given by the experimenters, on the diffusion of nitrous gas, purifying the air, and correcting the putrid and offensive smell. When we enter an hospital ward, where sick men are collected from other quarters, for the better chance of recovery we naturally suppose a pure air requisite, for pure air is the food of life ; and if this be not continued, the sick must sink, and the healthy become diseased. These wards, Mr. Menzies remarks, had an offensive smell ; no wonder that thirty-four people belonging to the Union had sickened ; it came chiefly from the necessaries, which he found unpardonably filthy, and unaccountably neglected. Mr. Menzies very judiciously begun his experiments, by getting these nuisances altered : it probably prevented all the remaining people from being infected. A physician pays but a sorry compliment to the superintendants of any hospital, when he comes to correct the foul air of the apartments by chemical agents. The Union at this time was lying at her moorings, and in the smooth water of Sheerness harbour : if offensive smells were issuing from the bodies of the patients, and if the seats were allowed to accumulate filth, were there no air flues, no ports, or flashes, that
could

could be thrown open, to invite the refreshing and health-giving breeze, and to expel the contaminated portion from within? This might have been done, I apprehend, without exposing the sick to excessive cold; for there was no occasion for keeping them constantly open; but there was certainly a necessity for opening them at intervals, in different parts of the deck, whenever the air became tainted; which was a more efficacious part of cure than any article of medicine that could come from the hands of their apothecary. This offensive effluvium, so disagreeable to smell, it plainly appears, was *sulphurated hydrogenous gas*, (hepatic gas,) the aerial product of fecal matter, and such as ascends from privies. It was indeed fortunate for the temporary reputation of Dr. Smyth's corrector, that this gas composed the tainted atmosphere; for nitrous gas possesses the power of decomposing it, and forming thereby new combinations that yield nothing offensive to the olfactory nerves. It is true that other substances, such as phosphorus and carbone, might also be mixed with the hepatic gas; but on the hydrogenous portion the nitrous gas chiefly acts, and the sulphur is precipitated, and with it the foul smell. In this manner nitrous gas alters the effluvia of confluent small-pox, when they approach beyond maturity; and also the offensive matter of large sloughing ulcers, which do not materially differ from the vapours that rise from the fecal mass. In the small-pox, it was lately employed for the purpose of destroying the infection

tion on board the Captain at sea; the finell, as might be expected, disappeared, but the contagion extended to other people, and was not got under till the ship returned to port. But this was no purification of tainted air, for it imparted no addition to the empyreal portion; and we think the effluvia would be more rationally expelled by free ventilation.

So absurd and inconsistent are prevailing opinions and habits of imitation in particular affairs, among mankind, that what is called a poison one day, may have the chance to be vended as an infallible remedy the day after. The sulphurated hydrogenous gas we have just mentioned, when mixed with a proportion of carbonic acid gas, is no other than the aërial vapour produced from the explosion or combustion of gunpowder, which has been so long used in his Majesty's ships for the destruction of contagion. It affords an ample but lamentable proof of the wavering and imbecility of all human reasoning. Dr. Smyth himself, we are very apt to believe, must have been strongly impressed with the dread of unfolding the weak sides of his doctrine, that he says nothing of the primitive principles of his nitrous gas. That must have soon reduced him to inexplicable difficulties; for he must have sought its constituent parts in the final decomposition of animal matter, by putrefaction; and after being evolved from his pipkins, whether in ships or hospitals, from its well-known elective attractions, he must have traced it through all its various degrees of oxygenation, till it became
nitrous

nitrous acid, without imparting a single quality to the air to support life; but on the contrary, to render it so much the worse, by the quantity it required to bring it to the state of an acid.

Something is said of the condition of the sick being meliorated by the nitrous gas. We have no doubt but the singularity of the business, and the apparatus which Mr. Menzies brought with him, must have engaged the attention and amused the minds of patients and by-standers: their spirits were likely to be elated by the confidence of receiving benefit from a fume which burst from the pipkin, as if by the magic command of the experimenter, and which, to illiterate seamen and boorish Russians, must have appeared a supernatural power. But where is the fact to prove that the vital portion of the air was increased: the nose is not to be considered the chemical test of the presence and absence of oxygene. It encouraged the nurses and attendants to pay more attention to their duty; certainly, the offensive smell which ought to have been prevented from taking place by other means, was now decomposed; but in other respects it must have acted like a charm, and thus rivalled the holy water of the Russian priests. For my own part, I never see or hear of the operation for diffusing the nitrous gas in his Majesty's ships, and the arrangement of the pipkins, but it brings to my remembrance the procession of images and crucifixes in Roman-catholic countries, which are carried about the streets by priests and friars, to deprecate Divine vengeance, during pestilence
and

and famine, or some dreadful convulsion of nature; and I rather suspect that their effects are much alike on the minds of the beholders: *Qui vult decipi, decipiatur.*

After all the latitude which the advocates for fumigation have thus given to its properties for purifying the air and preventing diseases, it can certainly never be employed in healthy ships for any reason yet produced from experience or from chemistry. In crowded situations, when the vital portion of the atmosphere is diminished by respiration, it can only be replenished by a fresh column from without, or by some process giving out oxygene. Nitrous gas, though possessing it in combination, cannot give it out under these circumstances; on the contrary, it tends still more to lessen the respirable portion from its strong attraction for oxygene, which it greedily combines with to the point of saturation. This quality of nitrous gas has been so generally noticed by chemists, that it is employed every where as an eudiometer for measuring the purity of any given quantity of atmospheric air; and is, I believe, the ingenious invention of Dr. Priestley.

The noxious quality of foul air generated in a ship's well or hold, differs materially from the unrespirable part of common air that may be accumulated in the upper decks. The former is no other than the *choak damp* of mines, the carbonic acid gas of modern chemists. It cannot be detected by smell, as the offensive hepatic gas may be done; and men and other animals are thus

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often

often killed in an instant, which frequently happens to carpenters, when the well has been long neglected in ships. On this kind of foul air nitrous gas cannot act, and can never be employed to expel it by any person acquainted with its elective attractions. Being readily miscible with water, it is dislodged from the well and hold of a ship by letting in pure water, and pumping it out again. Its presence is easily detected by lowering a lighted candle and lantern into the place where it may be suspected; the flame is extinguished, as it is incapable of supporting combustion. This lethal gas is generated in the holds of ships by the decomposition of moisture, but particularly beer, sugar, or other articles prone to fermentation, if casks happen to leak or to be stove. But salt or fresh water acting upon timber, or any vegetable substance, soon evolve it in great quantities; and being of greater specific gravity than common air, it occupies a lower stratum, and is always found at bottom.

We thus see that nitrous gas possesses no qualities for correcting contagions, more than the other gases employed by Lind and former physicians; and we think it has been brought into general use on very slender arguments in its favour, or rather from the evidence having undergone a very superficial examination. What has been thought the strong hold by its defenders, is the change of smell on its diffusion throughout the wards: but we have already said this is not an accurate chemical test. A very small proportion of
sulphurated

fulphurated hydrogenous gas (hepatic air) will render the air very offensive to the olfactory nerves, when it has little or no effect on the respirable part, and will not be perceived by the lungs. The residuum of air lowered by respiration is scarcely perceptible by smell; but the action of the lungs in inspiration is quickly affected, and a difficulty of breathing follows. Nay, carbonic acid gas has no smell whatever; yet, when taken into the pulmonary organs, it kills instantly; its taste is acidulous in water. On the other hand, a pure atmosphere, with its due share of oxygene, is rather distinguished by a negation of smell; but its properties are otherwise felt, by a full and grateful inspiration, expansion of the chest, exhilaration of spirits, alacrity of mind, and vigour of muscular motion.

Mr. Burd, surgeon of the Niger (*vide* MED. NAUT. vol. i. p. 155.) observed, that the offensive smell of the gunpowder fumigation between decks was constantly changed by the diffusion of nitrous gas: this is to be accounted for in the same manner as was done above, with the effluvia from the necessaries in the Union, the nitrous gas decomposing the carbonic-fulphurated hydrogenous gas. The oxygene of the nitrous gas combines with the hydrogene, by something like a slow combustion, to form water; and the small portion of azote, with the sulphur and carbone suspended in the hydrogenous gas, is precipitated, and with them the smell disappears. Thus it is apparent, and demonstrated by chemical facts, that the offensive

finell which Dr. Smyth's preventive corrects, proceeds from the *very substance* which Dr. Lind employed, and which is also directed to be employed at this moment, in the public instructions of Navy Surgeons, for destroying contagion throughout the British navy! And we shall see by and bye, that the nitrous gas of Dr. Smyth is no other than the *matter of contagion, the pestilential fluid* of a still later writer. Such is the instability of medical theory!—*in canne volubilis ævum* *.

The different perfumes which have been introduced into the practice of Physic, and employed in the apartments of the sick, to cover offensive flavours, we verily believe render the air still more noxious, however grateful they may be to the sense of smell; for most of them give out hydrogenous gas. They impart no oxygene to the atmosphere; and if we are to make the olfactory organs the tests of its purity, we must be constantly adding fresh quantities of the ingredient, whatever it is, in order to continue the same impression on the nose. The aromatic vinegar of the Edinburgh Dispensary, vulgarly the vinegar of the four thieves, is of all perfumes the most grateful: it may afford a transient stimulus to the nerves of smell; but its effects on

* Nitrous acid corrects the bad smell of water tainted by casks at sea from long keeping; but at the same time it renders the taste somewhat acidulous. See our experiments in Medical and Chemical Essays. Jordan, Fleet-street, London, 1795.

the atmosphere cannot be great. If vinegar, evaporated by the heat of the atmosphere, gives out oxygene, as I suspect it does, it had better be employed by itself. Substances that undergo combustion, for the purpose of yielding strong scents to impregnate the medium we breathe in, are still more pernicious ; for that process consumes a quantity of vital air : for the same reasons, whenever fires are employed, there ought always to be a free and uninterrupted circulation of external air. It therefore cannot be defended, that the impressions communicated by strong smelling substances can have any effect on our sensitive system, so as to make it resist the influence of marsh or human miasma, diffused in the atmosphere, taken in by inspiration, and spread over the whole bronchia of the lungs.—So much for fumigation and perfumes.

We have heard of a medical gentleman, a physician to a public hospital, and of the old school, who has never had the smallest curiosity to try what has been fulsomely called the *elegant* preventive ; but prefers the smoke of tar and pitch to all other substances. This physician, like many others, probably looked no farther than his nose ; and when he perceived that the smell of his tar was stronger than the hepatic gas, was satisfied that his patients were safe and breathing pure air.

The practice which we have found most successful differs from that of other physicians, chiefly in the following points: They have been entirely occupied in devising and instituting chemical means for destroying and subduing contagion, without being able to demonstrate what it is, or how it affects the sensorial power: our view has been directed to fortify the human body against its action, and by attending to those circumstances which assist its operation externally, or by predisposition of constitution. We have therefore never lost sight of a vital principle; and while we derive due advantage from chemical induction, we are constantly aware of its uncertain application to the living animal system. Experience may improve and mature our method of prevention, and vary the rules of practice to particular cases; but the principles on which it is founded must continue the same. We thus find it to be one of the most essential pieces of our duty to attend to the state of the mind in the early stage of infection, by employing various mental stimuli, so as strenuously to engage the attention of the patient, and by which means the first impressions of disease have been frequently overcome, and never renewed afterwards.

The very opposite nature of the substances which have been employed as prophylactics, and the weak grounds on which they have been brought into repute, were sufficient reasons for us to watch with jealousy their effects. When we saw them fail everywhere, even in the hands of their supporters,
it

it was but fair to allow us a new path to improvement ; in exploring which we have already arrived at a considerable degree of certainty, and our success is to be explained and made intelligible to every capacity, for it disclaims all theory.

It is somewhat singular that among all the variety of articles that has attracted the attention and excited the ingenuity of physicians, none of them have ever recommended a process for supplying ships or hospital-apartments with *factitious oxygene*. But it is easily to be perceived that their wits have been directed, not to the support of the vital flame by chemical agents, of health ; but solely to the destruction of the matter of contagion, by mortiferous vapours. Surely in the present improved state of chemistry, it might be produced with as much facility, and the ingredients for yielding it purchased at as cheap a rate as gunpowder and salt-petre. We are told that air, deprived of its purity by respiration in crowded places, favors the generation of contagion : then with an equal certainty must an increased proportion of pure air prevent or correct that generation. But there is a ready objection to all this : if officers are attentive, we think it can never be necessary ; some means can always be devised to ventilate the decks. In the apartments of sick on shore, if perfect purity is not to be obtained, infected people had much better be exposed in the open fields : there is more humanity in exposing a human being to the external air, than in stifling him with pestilential exhalations within doors.

The subject of infection has lately attracted more notice from officers, than was done on former occasions; they have listened with curiosity to the opposite arguments of physicians, and many of them have patiently read our sentiments on its propagation and extinction. We have met with some who have entered warmly into the dispute, and have made themselves sufficiently acquainted with the chemical doctrines of the day, to decide with impartiality on the merits of the controversy. Soon after the nitrous gas had received the sanction of the Commissioners of Sick and Wounded to be employed in the navy, some suspected cases appeared in a ship at Spithead, not attached to the channel fleet. The surgeon informed his captain of his suspicions, and his wish to comply with his new instructions, in diffusing the nitrous gas, which, he added, had obtained the first character as a prophylactic. The captain had just been reading on the subject: "Pray Mr. —," he said, "what do you take contagion to be?" He quoted Dr. Smyth's authority in giving an answer; but the inquisitive officer was not satisfied.

"How does nitrous gas act on contagion?"

Dr. Smyth's book was again resorted to; it was not satisfactory. They turned to Mr. Keir's letter, which the doctor adduces in support of the salubrity of his gas. This only rendered the business more obscure. It was like Mr. Shandy and Uncle Toby's dialogue on parturition. "Dr. Smyth and the chemist seem at variance," said the captain;

captain; " he speaks of a *vitious fermentation* ;
" this is a phrase I do not understand."

" Nor I," said the surgeon; " but to explain
" it their way, I apprehend there is a necessity
" for terms that chemistry does not at present
" employ."

They walked along the decks, they were clean and dry; the people clean and well clothed: a maintopmast stunsail nicely balanced and trimmed, as I have seen it in the Royal Sovereign and other well-regulated ships, with wind-sails at the fore and after-hatchway, had made the air as pure as above. They both agreed that no nitrous gas could be wanting there. They visited the sick berth: " This indeed is offensive," said the commander, " and you had better try your fumigation." The surgeon ordered the sand to be heated, and the fumes ascended from the pipkins. About an hour, and the air had no smell. In a short time the offensive flavour returned; the fumigation was renewed, and it again disappeared; but the sick rather complained of coughing, and one of them vomited. In an hour the effluvia became as disagreeable as at first: some foul utensils were now discovered in a corner; they seemed to taint the air, and were ordered away to be cleaned. The offensive vapour never more returned. " Now," said the discerning officer and surgeon, " this description answers exactly to the
" account given of the Union hospital-ship; but
" instead of calling in the assistance of nitrous gas
" from a London physician to destroy this foul
E 4 " air,

“ air, it will be a more healthy practice to prevent its production, which we can do *gratis*, by the pure winds of heaven.”—“ Thus,” added the captain, “ I can see how institutions of this sort may do harm; this gas, as it overcomes nastiness of smell, may happen, in indolent hands, to supersede the use of soap and water, and we shall be overwhelmed with filth.” The explanation of contagion stopped here; and as to the explanation of correcting the offensive matter, we have already given that. We thus see to what embarrassments people must be exposed, who attempt to defend a practice of physic that rests on no appeal to first principles, and unsupported by unequivocal testimony of its success*.

An implicit confidence in the authority of physicians, and passive obedience to their directions, have certainly, on nameless occasions, prolonged infection in his Majesty's ships; for the process of fumigation, till lately, had engrossed the whole attention. We need only resort to Dr. Lind's works, for the full confirmation of this truth. The unreflecting part of mankind, in all ages, have been prone to admire what they could not comprehend; and from a love of the marvellous, whatever has been delivered in a mysterious manner, has been followed by the credulous multi-

* Oxygenated muriatic-acid gas also destroys the offensive smell arising from privies, or the matter of sloughing ulcers, by decomposing the sulphurated, carbonated, phosphorated hydrogen.

tude, while they have rejected every thing that is obvious to the senses. The whole preventive means hitherto, it therefore is evident, have depended on speculative doctrines about the nature of contagion: and from having no fixed principles to go upon, they have varied and fluctuated like all human opinions. It will always be our wish to confine this duty as much as possible to the hands of officers: it must be familiarised to them; systematically interwoven with habits of discipline, and to be enforced by their authority, if ever it is to attain that perfection that it is capable of.

Since our last publication, as we observe our rules to be more punctually followed, we also meet with increased success in proportion. There have been but few ships infected during the last two years; but they have not been so, without bestowing us lessons of advice. We shall detail the whole, beginning with those where our rules were not adhered to.

In March 1797, *La Nymphe* frigate received the infection from some French prisoners, which appeared first in two men that had come from a prize. The worst cases were sent to Plymouth Hospital, but others were kept on board and recovered. The surgeon had just received the new code of instructions from the Board of Sick and Wounded, and began the nitrous fumigation as there directed; but it was not strictly persevered in. In April the ship came to Spithead, having buried one man in the passage. The fever continued to spread; and before the 18th of May,
eighty

eighty patients were sent to hospitals. Mr. Outram left her about this time; and it appears from the report of his successor, who joined *La Nymphe* in July, that the infection was not subdued at that time, or entirely extinguished till September.

Mr. Gray says, “ I cannot account for the introduction of the fever, as it made its appearance previous to my joining the ship: but from the information which I have been able to collect, I am led to think she had never been clear since it was brought on board by French prisoners in March. It was not malignant in my time, and several were but slightly affected. We had the satisfaction to see it completely subdued before our return to port. The means used for this purpose were their immediate separation, allowing them no kind of communication whatever with the rest of the people. Their clothes were taken from them, aired and washed, and not returned till their recovery. Fires were carried daily betwixt decks, and constant ventilation with windsails attended to. Fumigations with the nitrous acid were also used: but whether they were more effectual in destroying the contagion than the other methods, I have not observed*.

“ The symptoms of this fever were, cold shivering alternated by heat; head-ach; pains of

* Is it not equally probable that the nitrous fumigation prolonged this infection? There is as much reason for that supposition as the other.

“ the back, knees, shoulders, and breast ; sickness
“ at stomach ; pulse weak and frequent ; tongue
“ foul ; thirst ; loss of appetite ; dejection of spirits,
“ and great debility. I treated it by emetics in
“ the commencement ; a sudorific, composed of an
“ opiate and antimonial, at bed-time ; antimonials,
“ wine, opium, and cinchona. October 4th,
“ 1797.” I do not quote this prolonged infection as an instance of the inefficacy of the nitrous gas : but if confidence in the new process attracted the attention of either the surgeon or officer, from the careful and immediate separation on the first appearance of fever, it is to be regretted much. We have no hesitation in saying, that this contagion ought to have been extirpated in a fortnight, had our rules been strictly complied with. The anarchy which prevailed in this ship about the beginning of May was also another cause of this fever being protracted.

In June 1798, the variolus contagion appeared in the Captain of 74 guns, with the fleet off Ushant, and of the confluent kind. The first case was detected in due time, but Captain Aylmer had no means of getting quit of the man. As the pustles arrived beyond maturity, the effluvium from the diseased people became exceedingly offensive. The nitrous gas was diffused occasionally to correct this smell, which it always effected ; but the infection was progressive ; the disease continued in the ship for ten weeks, and was cleared at last by going to port. Fifteen people had the small-pox during the
cruise,

cruize, of whom seven died. (*Vide* SMALL-POX.) It is easy to understand what this offensive smell was: but would it not be better to prevent its accumulation by perfect ventilation?

The contagion of La Nymphé was carried to the *Defiance* by a boat's crew, who were obliged to remain in the frigate a whole night, in a gale of wind. It first appeared in the boat's crew, and afterwards spread to others. But its presence being quickly detected by the vigilance of Mr. Glegg, it soon engaged the attention of Captain Jones and his officers, and was overcome in due time by means which must always be effectual in well-ordered ships, without the quackery of fumigation.

A similar fever appeared in *La Pique* in the summer of 1797, and was imported by raw landmen from the receiving-ship. It was early discovered among these men by Mr. M'Donald, and never affected any others of the ship's company. It soon disappeared; the means which the surgeon recommended being well enforced by the accurate discipline of Captain Milne and his officers. (*Vide* Mr. M'Donald's Report in the General Abstract.)

The *London* also, at this time, had ten cases of typhus, derived from the same source, and entirely confined to raw landmen. They soon recovered in a cleanly and well ventilated sick berth, under Mr. Smith's care.

We consider it a fortunate circumstance for naval service, that we always meet the most cordial support

support from Officers in this important duty ; and we think it no less fortunate, that in these recent instances of successful extirpation, no fumigation was used, that might hereafter bias the practice. But do not these fresh facts, so obvious and simple, assure every unprejudiced observer, who is open to conviction, that such means, zealously employed, must always be effectual. And on the other hand, do not these plain facts also justify the conclusion, that contagion had *never* yielded to fumigation ? that the process is not only superfluous, because ineffectual, but that it is pernicious, by loading the atmosphere with unrespirable gases, and thereby diminishing that portion on which life depends. When, therefore, fevers have continued to spread for many weeks, during the employment of such fumes, is it not fair to affirm that these increased the rage of infection, because sulphureous gas, nitrous gas, &c. are destructive to animal life ? and being used in diffused and smaller quantities, are only poisons in a more diffused and smaller form. And all physicians have agreed, that there is a condition of the living body which singularly favours the progress of typhus fever, and which they have called *predisposition* ; and that this condition is particularly induced and increased by breathing air not sufficiently pure ; which impurity, in this instance, must always obtain wherever these fumigations are diffused in a breathing medium.

We have been called upon to give our opinion, in what manner contagion affects the human body : Is it to be considered as a stimulant, exhausting the sensorial power, and producing indirect debility ? This subject has been hastily disposed of elsewhere : we have still many doubts ; but our reflections are not sufficiently matured to decide. The matter of contagion, whatever it may be ; it may be nitrous gas, or any other gas ; certain it is, that it affects the human body by first impregnating the atmosphere. All these gases, we readily admit, may be called stimulants, if taken into the stomach, or applied to an excoriated surface ; but as diffused in the medium which animals breathe, they render it less fit for respiration. The elective attraction of the lungs giving out and receiving noxious and salutary principles, by expiration and inspiration, is destroyed by the presence of the contagious miasmata ; and the first symptoms of infection would appear to be the imperfect expansion of the lungs, abstraction of heat and oxygene, with a corresponding sensation throughout the whole frame. We see no reason, however, that excludes the supposition of the hurtful quality being *first* applied to the nerves spread on the delicate membranes of the bronchia, and *from them* communicated to the system. Is it inconsistent with the wise provisions of defence which Nature has given to other organs, to say that the nerves expanded on the pulmonary vesicles are endowed with a perceptive disposition, that enables them to distinguish the hurtful qualities of the air, abstracted from all

chemical

chemical combination, which respiration may effect on the vital fluid? Is it too gross to say that they feel? that they possess an animal appetency for the express purpose? Their sense we know to be most exquisite, from the least irritation throwing the trachia and bronchia into convulsive action. And these nerves must be admirably suited for that intention; as the blood, warmed and stimulated by every fresh accession of oxygene, must be constantly bestowing excitement. Surely it is reasonable to admit from analogy, that the lungs, so wonderfully constructed, may distinguish a poisonous quality in the air through the medium of nerves, as well as the optic nerves should discern light. Sulphurous and nitrous gas excite coughing: an excoriated or wounded part feels an increase of pain, when held in a vessel containing oxygene gas: with equal propriety, therefore, it may be said that the pulmonary nerves become diseased by the application of contagious matter, and that the lungs in consequence cease to perform aright their chemical functions. I am led into these reflections by being persuaded, that this subject has been considered too much in a chemical view; and the presence of a vital principle operating in the system, made but of secondary consequence in this sublime operation of Nature. Whether this opinion will be admitted or not, our doubts are not yet removed, that the effect of contagion is the abstraction of stimulus from the body, and the succeeding typhus a disease of direct debility.

We

We can hardly suppose that contagious matter acts as a stimulant producing indirect debility, when we see its action so manifestly assisted by predisposition, and that depending generally on a debilitated state of body. Its previous stimulant power has never been marked; and the very slow progress of the early symptoms sometimes are a strong argument against its existence. But if it induces fever, by directly affecting the organs of respiration, by deficient stimulus to *their nerves*, or by imparting *less oxygen* to the blood, the whole operation may be accounted for without admitting its stimulant power. The diseased condition of the stomach, we think, is always a secondary as an attendant on the febrile state: the contrary opinion arose chiefly from the notion, that the poison was received by the mouth, afterwards taken into the circulation, and there became the cause of the fever. This could never be the case in those instances where contagion in a moment, quicker than thought, induces wild delirium, and sometimes instant death. As acting immediately on the organs of respiration, the fact is explained; and also leaves us strongly impressed, that the nervous system is primarily affected.

We also consider the best prophylactics to be whatever gives a moderate degree of excitement to both body and mind; such as temperance in eating, wine or fermented liquors in due quantities, amusements, regular hours of sleeping and waking, moderate venery, &c. If, however, we should
with

with to prevent typhus, when exposed to the infection, if of a stimulant nature, bleeding, purging, and low diet, would be the best security. These are the most certain preventives, in warm climates, in European constitutions; but we judge them to be rather unsafe in our latitudes, and in our low fevers.

The whole phænomena of fever may therefore be resolved as a series of sympathetic affections, from impressions made by a noxious power on our sensitive system: that the duration of these impressions, as overcoming the natural habits, constitutes the disease; and the removal, the recovery of health with all its associated actions.

While this subject was engaging the attention of different physicians in England, and while the nitrous gas of Dr. Smyth had been honoured with the patronage of the Commissioners of Sick and Wounded, and directed by their official authority to be employed for destroying contagion throughout the British navy, a very different doctrine has been promulgated on the Continent of North America by Professor Mitchill, of Columbia College. It is no other than a direct assertion, that nitrous gas, the septic gas of the author, is a *pestilential fluid*, and the matter of contagion itself. Such an opposition of opinion as this, in an age renowned for the penetrating spirit of inquiry,

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and at a time when chemical philosophy had attained such perfection, is one of the most humiliating lessons to the pride of human knowledge that has ever been taught in the school of science. If the theory of Dr. Mitchill is to be ultimately established, how mortifying the reflection, that the fleets of Britain have been freighted with a pestilential vapour, and that, like the companions of Ulysses, our seamen were liable to perish by winds which they carried in bags along with them !

This doctrine, which has been published in America, and delivered for some years in the Professor's Lectures; was first printed in England, in Beddoes' fifth and last parts of " Considerations " on facitious Airs ;" Johnson, London. After the example of the Medical School of Edinburgh, the Students of Columbia College have taken the subjects of their inaugural dissertations from the lectures of the Professors ; and the Mitchillian theory of contagion and fever has been defended in some of these, by ingenuity and abilities that have not a little contributed to give it stability, and to render it popular. A Thesis on the natural and medical History of Septon (azote); by Dr. Saltonstall, is reviewed in the Appendix to the twentieth volume of the Monthly Review, for August 1796. This fell into my hands while compiling my chapter on Contagion, and is mentioned in a note, vol. i. p. 246 of MEDICINA NAUTICA ; which was all that we knew of the doctrine at that time.

After

After perusing our work, Professor Mitchill has been so kind as to favour me with a number of papers on *Septon*, which contain a continuation of his doctrine, in various communications to his friends; and also some inaugural dissertations of his pupils, who have distinguished themselves in support of the theory. They may therefore be considered as a sequel to the essay published by Dr. Beddôes. These communications have been honoured by the particular attention of Sir John Temple, Bart. and transmitted by him to Mr. Nepean, Secretary to the Board of Admiralty, for our perusal. We have no doubt but they will be highly acceptable to the English reader, and particularly valuable, at this time, to the Surgeons of the Navy and Army.

While Britain mourns with widows and with orphans, and the flower of her navy and army is daily falling a victim to an irremediable contagion, every well-meant endeavour to lessen mortality, and throw light upon the subject, deserves the gratitude of mankind, and must be eagerly sought after by the professional gentleman. We have lately read with horror the ravages which the yellow fever continues to make at Philadelphia and New York. There seems indeed a stated return of the pestilence, that revolves with the season; and August, September, and October, are the devoted months, when the human race must be desolated by its scourge. It is now generally agreed among physicians in America, and we ourselves always

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thought

thought so, that this dreadful epidemic is generated in their own neighbourhood, and the baleful offspring of their swamps and marshy savannas. The idea of its being imported is therefore no longer supported; and arguments drawn from coffee rotting on the wharfs, or infection brought from Boulam, have all given way to the certainty of its North American origin. The Americans must therefore look at home for its prevention, and, by changing the surface of the soil, destroy the laboratory of the poisonous exhalation.

There is one question, however, to be asked at this place. If the fever is indigenous in North America, how comes it to have appeared so seldom in that country before? Has any great change of modes of living taken place in the United States, that has made the inhabitants barter the health of the simple planter for the pestilential diseases of the town and city manufacturer and merchant? I am apt to believe there is something of this kind, though not taken into the account by their medical writers. English tables will produce English diseases in America, as well as in the West-India Islands; and the changes which the excitability of the system must undergo, between the severe cold of their winters and the extreme heat of their summers, exactly corresponds with the fact, and explains the predisposition to a fever, highly inflammatory on its accession, rapid in its progress, and thus from its genius suddenly fatal in the issue. If this be the case, and you wish to live healthy,

healthy, ye wise Americans ! forego the luxury of European banquets, and return to your primitive simplicity of living.

Independent of the rising celebrity of the learned author, some local circumstances have occurred in New York, which have given to those opinions a degree of credit little short of demonstration. It appears that the legislature had enacted severe laws against the manufacturers of soap and candles, under the idea of the smell being unpleasant it must also pollute the atmosphere, and assist the propagation of the reigning pestilence. The benevolent professor became their advocate, convinced the government of a mistaken policy, and the obnoxious statutes were repealed ; for upon mature investigation, it was proved by the most clear and satisfactory testimony, that the neighbourhood, and the citizens employed in these greasy occupations, remained healthy and exempted from the fever, while death and desolation were following its footsteps in all other directions. The explanation of a fact so striking could not escape the active mind of the enlightened Mitchill. The septic gas (nitrous gas) having a strong attraction for all inflammable substances, rapidly decomposes the fat of the soap and tallow, and is itself decomposed ; it also, by attraction, converts the alkaline ley into nitre, and thus covers its pestilential qualities.

These communications were accompanied by the following letter from Dr. Mitchill, in which I gladly recognised the name of an old acquaintance, and fellow-student at Edinburgh.

F 3

“ S I R,

"SIR,

New York, May 26th, 1798.

"I see in your *MEDICINA NAUTICA*, under the article "Contagion," an interesting discussion concerning the efficacy of nitrous gas, or smoking nitrous acid vapour, in destroying infectious or pestilential matter in ships. This practice, which has been so loudly extolled, appears to me to be one of the most preposterous and ill-contrived that could ever enter the head of man. The reason of it, however, as you observed, is evident; it is a relic of the old *animalcular hypothesis*, and is partly supported by the fashionable opinion that *alkalescency* peculiarly characterises putrefactive processes, and therefore must be overcome by some subtil and penetrating acid.

"As I found you engaged in earnest in combating a practice which I think wrong in principle, and as, on that point, your sentiments nearly correspond with my own, I resolved to write to you by the first opportunity on the subject. I was the more emboldened to do this, as I saw you had in a note referred to some opinions of mine, which were almost diametrically opposite to those of Dr. J. C. Smyth, and which you had become acquainted with only through the medium of the *Monthly Review*: there was too another reason for sending you my sentiments relative to pestilential air; for, if I mistake not, you and myself were cotemporaries in Edinburgh, and have passed many evenings together in the societies there; though, as I was very young, I question if you recollect
me.

me. I served in the Medical Society one season as Curator of the *Experimental Committee*, and as a member of the *Purchasing Committee for the Library*.

“ On leaving Europe I returned to New York, the place of my nativity, where I have since resided. The city of New York contains about sixty thousand inhabitants. It has a well-endowed, large, and much-frequented hospital, and I am one of the four physicians who have charge of the medical department of it. In the city is a very respectable college, and I hold the professorship of chemistry, natural history, and agriculture. And I also am one of the members of the state-legislature for the city of New York.

“ You, doubtless, have heard of our visitations, in the cities along the American coasts, by a distemper called Yellow fever. Our city has been afflicted by it more than once. My opportunities of seeing and observing have, as you may readily suppose, been pretty frequent and extensive. After much time and labour bestowed on the subject, I have attempted to generalise the facts, and reduce them to so much of system, as to make out a “ Theory of Pestilential Fluids,” including both the aërial and liquid forms, of infectious matter.

“ Owing to the pressure of heavy calamity upon us, our attention has been turned with more than ordinary keenness to detect the cause of our distress. Pestilence has been discussed, in our college, our hospital, in our municipality, and in our legislature. We seem pretty generally satisfied

here, that some combination of *septon with oxygene* produces the genuine form of pestilential fluids; and consequently, *alkaline substances, oily bodies, water, &c.* (for septic acid will unite with all these), are the remedies, preventives, and antidotes. *Acid fumigations are laughed at here.* We wonder how men of sense and science can recommend or even endure such practices. I shall own myself mistaken if the boasted specific for syphilis, *i. e.* nitric acid, does not turn out in like manner to be an instance of deception to the publishers of cases, and to the public. Both proceed on the same hypothesis; both must stand or fall together.

“ My doctrine, I deliver in my lectures, and the Dissertations I send you, by Drs. Saltonstall, Bay, and Lent, will evince to you the effect produced on the minds of our students. Besides these, I wish you to attend very particularly to the *case of the tallow-chandlers and soap-makers*, bound up in the volume. It was intended to turn these tradesmen out of the city for generating pestilential air. They took counsel, and remonstrated against such violent proceedings. The arguments, affidavits, and notes, were drawn up and employed to procure a repeal of the law: and I have the satisfaction to inform you, that truth has triumphed, the legislature and the public are satisfied, and the oppressive statutes are repealed and done away. The argument was drawn up in as *popular* a style as possible; it therefore contains few technical terms, and it has fully answered the purpose for which it was intended. Subjects of this sort seldom

dom become matters of such rigid inquiry and sober public examination as this has done here.

“ With many wishes for your personal happiness, and for the success of our enquiries, believe me to be yours sincerely,

“ SAM. L. MICHILL.”

“ To Dr. TROTTER, &c.”

While Professor Mitchill was thus employed in giving to mankind a new doctrine of contagion, founded on the fine discoveries of pneumatic chemistry, a third quarter of the globe was becoming also a field for improvement and observation, and has produced a method of prevention and cure, fundamentally the same with that of the American physician. The following account is taken from a periodical publication, for I am ignorant if any other is before the public.

THE PLAGUE.

Nisi utile est quod facimus, stulta est gloria.

(A. R. Sc. Lib.)

“ THE following short directions for the prevention and cure of the plague are compiled from a small pamphlet in the Italian language, published by Count Berchtold at Vienna in 1797, one copy of which is in the possession of the Royal Academy of Sciences at Lisbon, to whom it was pre-

sent by his excellency Mr. Pinto, her Majesty's secretary of state, &c.

“ The academy has ordered translations to be made into Arabic, French, and Portuguese; and this extract in English is particularly intended for the use of the numerous bodies of British subjects at present employed in their country's service in this part of Europe; as the garrison of Gibraltar, the fleet at sea, the troops on shore in Portugal, and the masters of British vessels in its harbours.

“ The compiler has no other information whatever concerning it, than that contained in the pamphlet, nor does he know if any thing upon the subject has yet been published in England. He leaves the reader to believe or reject according to his judgment, heartily wishing there may never be a necessity for putting it to the trial.

“ Count Berchtold says, that the method was first proposed by G. Baldwin, Esq. his Britannic Majesty's agent and consul-general at Alexandria in Egypt, who, during a long residence in that country, after much thought and observation, was induced to believe that the use of sweet oil applied to the skin, might prove beneficial in the treatment of this dreadful and hitherto incurable malady.

“ Mr. Baldwin communicated his ideas to the Rev. Lewis de Pavia, chaplain and agent to the hospital called St. Anthony's at Smyrna, who, after five years experience, pronounces it to be the most efficacious remedy hitherto made use of,
for

for the space of twenty-seven years that the hospital had been under his management. He acquainted Count Berchtold with the success and the mode of application, and from his communications the pamphlet seems principally to have been composed.

“ Count Berchtold further says, that it is Mr. Baldwin’s intention to publish a more full and philosophical relation of his observations and experiments; that he favoured the Count with a perusal of his manuscript, and permitted him to transcribe any part of it; and he apologises to the world and to Mr. Baldwin for this seeming anticipation of the work: at the same time observing, that he feels a sacred and indispensable duty to lose no time in making known a discovery of such importance, particularly to those countries that are nearer, and have more frequent commerce with the Barbary states and ports of the Turkish empire.

“ The directions are simply these: immediately that a person is perceived to be infected with the plague, he must be taken into a close room, and over a brazier of hot coals, with a clean sponge dipped in warm olive oil, his body must be briskly rubbed all over, for the purpose of producing a profuse sweat. During the friction, sugar and juniper-berries must be burnt in the fire, which raise a dense hot smoke that contributes to the effect.

“ The friction ought not to continue more than four minutes, and a pint of oil is enough to be used at one time.

“ In

“ In general, the first rubbing is followed by a very copious perspiration; but should it fail of this effect, the operation may be repeated, first wiping the body with a warm dry cloth; and in order still further to promote perspiration, the patient may take any warm sudorific drink, such as elder-flower tea, &c.

“ It is not necessary to touch the eyes; and and other more tender parts of the body may be rubbed more gently.

“ Every possible precaution must be made use of to prevent the patient from taking cold, such as keeping covered those parts of the body not directly under the operation; nor must the linen be changed till they perspiration has entirely subsided.

“ The operation should be repeated once a day, until evident symptoms of recovery begin to appear.

“ If there are already tumours upon the body, they should be gently and more frequently rubbed, till they appear to be in a state of suppuration, when they may be dressed with the usual plasters.

“ The operation ought to be begun on the appearance of the first symptoms of the disease; if neglected till the nerves and the mass of blood are affected, or a diarrhœa has commenced, little hopes can be entertained of cure: but still the patient should not be despaired of, as by an assiduous application of the means proposed, some few have been recovered, even after the diarrhœa had commenced.

“ During

“ During the first four or five days, the patient must observe a very abstemious diet : the author allows only a small quantity of vermicelli simply boiled in water. Nor must any thing be taken for the space of thirty or forty days, except very light food ; as he says an indigestion, in any stage of the disorder, might be extremely dangerous. He does not allow the use of wine till the expiration of forty days.

“ There is no instance of the person rubbing the patient having taken the infection. He should previously anoint himself all over with oil, and must avoid receiving the breath of the infected person into his own mouth or nostrils. The *prevention* to be used in all circumstances is that of carefully anointing the body, and living upon light and easily digestible food.

“ One of the many ingenious observations made by Mr. Baldwin is, that amongst upwards of a million of inhabitants, carried off by the Plague in Upper and Lower Egypt during the space of forty years, he could not discover a single oilman or dealer in oil.

“ *Lisbon, 1797. By Royal Permission.*”

The practical precepts contained in this simple narrative exactly correspond with those of Dr. Mitchill, although we can observe, that here and there they lean to a pathology that is now forgotten. The diet and regimen are also similar, and are very judiciously chosen, no doubt, by the best
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of all guides, Experience. The Medical Board of the Navy and Army must of course have published this method of prevention and cure ; and we shall anxiously wait an account of the result of its trial in the yellow fever of the West Indies among the seamen and soldiers.

The American dissertations afford us most favourable specimens of the progress of medicine on the other side the Atlantic. They bring to our remembrance our past studies, those *balcon days*, when the ardent pursuits of the young inquirer were so earnestly patronised and cherished by the example and countenance of the never to be forgotten Dr. Cullen. To us they are particularly satisfactory, as they seem to realise some of those predictions which we made in our second edition of "Observations on Scurvy," which was one of the first attempts to explain pathology from pneumatic chemistry. But they will be doubly valuable by extending the field for discussion, and inviting the learned to take share in the inquiry ; and by enlarging the resources of the medical profession, they will contribute to check the breath of pestilence, and alleviate one of the most serious afflictions that has ever scourged any nation or country.—(*Vide APPENDIX.*)

MEDICINA NAUTICA.

THE YELLOW FEVER.

SINCE the publication of our former volume, many opportunities have offered for my conversing with officers and surgeons on this fever, as it appeared in ships and on shore. I have also perused journals and remarks by different medical gentlemen; but alas! they hold out nothing consolatory; the whole is a catalogue of mortality. Some physicians have lately written on the subject; the history of the disease and its attending circumstances have been accurately marked and detailed; but we have yet to deplore the imbecility of our art in checking the ravages of this Herculean malady. If the public papers shock us less than formerly, by accounts of fewer deaths, it does not proceed from a more successful method of cure having been discovered, but from a smaller number of unseasoned Europeans being now employed in the service of the country among these unwholesome regions. To such a field for remark we return with increased regret; again we weep over the grave of friendship, the untimely fate of the companions

panions of our youth, our associates in service and the perils of a sea life, all that was amiable in the acquaintance, or noble-minded in the officer !

——— and all quality,
Pride, pomp, and circumstance of glorious war !

On reviewing the practice of different medical gentlemen in the yellow fever, we are led to think that the treatment recommended by Dr. Moseley has been incautiously resigned or laid aside, for the unaccountable exhibition of immense doses of mercurial preparations. That physician has certainly given by far the best history of the endemic causus of the West-Indies. He had been twelve years in the islands before he wrote, and had not conceived his opinions on hasty conclusions drawn from the fevers of a few patients, or any particular season ; but by nice observation had marked the genius of the distemper, which, in his narration, is very simple. We earnestly wish to see the work of Dr. Moseley in the hands of every navy surgeon going to the West-Indies ; and till his practice has been tried in a manner different from what has yet been, we cannot be satisfied but much may still be done in the cure of yellow fever. This writer has duly appreciated that careful attention to discriminate the various changes which on a sudden take place in the rapid progress of the disease. In this it would appear all the art lies ; for if bleeding and purging are not used during the early stage, or at the commencement, their effects may be to add to the disease. Yet the exhibition of calomel in
thousands

thousands of cases, was often persisted in to the last: this must have been done very frequently on most unjustifiable ground; for the disease at different periods must require a different treatment; and such errors must occur wherever a nice discrimination of symptoms is superseded by rules not sufficiently established on the basis of due experience.

The following letter of Mr. Edward Laing gives a melancholy account of the fate of our countrymen in the army under Sir Ralph Abercrombie. Mr. Laing was surgeon of the 57th regiment.

“ DEAR SIR,

Carriacou, 28th Dec. 1796.

“ You have no doubt heard, long ere this, of the dreadful mortality among the troops in Grenada, as well as in some of the other islands, particularly St. Lucie and St. Domingo.

“ Soon after the reduction of St. Lucie, the 57th regiment was ordered down to Grenada, where they have remained. Until lately we had the credit of being the healthiest regiment in Sir Ralph Abercrombie’s army, but we are now suffering as much as the others. In the beginning of July we were completed by draughts to 1130 men; we have not now 500 remaining; and out of these not above 180 fit for duty!! I think the other regiments have still suffered more than we have.

“ We have lost a second surgeon, two mates, and I fear a third will soon follow. About six

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weeks ago I was attacked with fever, which left me in so weak a state, that I was obliged to come to this island for change of air : I expect to return to Grenada in ten days.

“ The fever, which first made its appearance among the 27th in St. George’s, was very rapid in its progress, frequently proving fatal in three days, and was generally called by the medical gentlemen of the island *Boulam*. But I doubt much its origin being African ; I must confess, however, that I am not at this time prepared to combat their opinion, nor to give one of my own that could be well supported ; but strongly suspect, that the cause depended more upon the *unassimilated European constitution*, than upon infection, though I do not deny this last a share in spreading the disease, particularly after the hospitals were crowded. The symptoms of the disease are well described by Chisholm ; but I am sorry to say his treatment did not answer the sanguine expectations formed of it ; nor can I find that his great success was known, even in Grenada, till after his publication came out. I have often found calomel useful ; but it is only when visceral obstruction is present. After all, I suspect that we shall find our account in attending more to *prevention*, by gradually bringing the gross European habit down to the West-India standard, and in this way obviate the violent inflammatory symptoms, with which I apprehend this fever first attacks. Instead of strengthening the body, as is commonly done by tonics and stimulants, to resist disease, we must
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in such habits pursue the opposite plan, and depend upon evacuations and temperance.

“ I made an attempt on the passage from England, with the men of our regiment, to take off the inflammatory disposition. On first coming into the warm latitudes I had a general order given, that they should take the medicines, which were small doses of calomel, at night, and sea-water in the morning, repeated twice a week : and although we have lately lost so many men, I still think it was of great use. We were healthy at Barbadoes, we continued so at St. Lucie, and likewise while they were in the woods in Grenada : but since they were in quarters where rum was to be got, we have been as sickly as any other regiment. I have by me many strong proofs that rum has been the principal cause of all our misfortunes.

“ The fever which prevails now is not so violent in its symptoms as that called Boulam : it is more of the remitting kind, generally putting on the quotidian or double tertian type, but even in these forms proves fatal ; the remission being so short, the patient cannot bear a sufficient quantity of bark to prevent the return of fever. I have of late ventured on the use of arsenic, and in several cases with success, where the bark had failed, from not being retained. Where this fever continues long, it generally ends in obstructions of the liver and other viscera. Believe me to be, dear Sir, yours, very sincerely,

“ EDW. LAING.

“ To Dr. TROTTER, &c.”

This concise narrative of Mr. Laing entirely corresponds with our former animadversions on this subject. It is certainly by attending more to preventive means, that advantage is to be gained; and it is our opinion that this has not been the case hitherto. We have indeed seen some trifling papers handed among the private soldiers going to warm countries, called "Rules for preserving Health," compiled, I have no doubt, with the best intentions, but not delivered to the people as they might have been; and I believe were seldom regarded by those whom they most concerned. The changes that are to be brought about in the habit of body, for securing health in these climates, is not to be done by temperance only; it is to be done by abstemiousness, as to animal food and fermented or spirituous liquors. Yet there are some who pretend to argue that these are not the means. We hear the escape of one drunkard and one glutton cried up, who here and there have continued free from disease; while thousands have fallen that never thought of subtracting a single drop from their cup, or reducing their allowance of beef or mutton. There is enough known of the nature of the Yellow Fever to carry our rules of prevention to much certainty, and they ought to be more rigidly enforced.

From Mr. Laing I hoped for much valuable information on the West-India climate and diseases; but, alas! I was soon disappointed. This worthy young man, in the bloom of youth, died at Trinidad, shortly after it was in possession of his Majesty's forces,

forces, in a relapse of the fever. With a liberal education in all the auxiliary branches of medicine, he was a zealous inquirer, and possessed in an eminent degree all the *milk of human kindness*, so essential to the medical character.

— cui Pudor, et Justitiæ foror
 Incorrupta Fides, nudaque Veritas,
 Quando ullum invenient parem?
 Multis ille bonis flebilis occidit:
 Tu frustra pius, heu! non ita creditum,
 Poscis Quintilium Deos.

We formerly recommended a reduction of the seamen's diet in going to warm countries, as the best preparative for the climate. But what are we to say now, when the most pernicious part of it, the allowance of spirits, has been increased one eighth, and that too from the imperious demands of these inconsiderate men themselves. Infatuated beings! who never yet did right when left to themselves! There can be no doubt but the changes of living in Britain, the more general use of animal food and strong malt liquors or spirits, among the lower orders of people, have eminently assisted in producing that gross and full habit of body, which becomes the devoted victim of the West-India fever. Look at the pampered life the English soldier now leads; for while he is quartered at home, he has little else to do but eat and drink; in short, that predisposition to inflammatory

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tory diseases among them appears so strong, that if they had been fed for the purpose, it could not be better accomplished. We therefore see how difficult it is to alter modes of living. As soon as these men are landed on a West-India island, they eagerly grasp at spirits, and the more so, because they find rum so much cheaper than they did at home, that there is no moderation to the use of it. This spirit is the last stimulus that is required to strike fire, when the constitution may be said to burst into flame, till the vital principle is literally burnt out of its mansion in the space of a few hours by an ardent fever. No wonder then so fine a regiment as the 57th should, in so short a time as three months, bury seven hundred men, as appears from Mr. Laing's description!

From the best accounts which we have received, we are induced to believe, that the preservation of our ships' companies very much depends on keeping them on board, and cutting off all communication with the shore, but on the utmost necessity. I observe that some captains have been very rigid in adhering to this rule, and they have always found advantage in so doing. We suspect that these seas are as favorable to health as those of Europe; and the facts appear now very clear. What a pity it is, then, that we should ever so much lose sight of our superiority, as to land an army in an enemy's island. The great mortality in ships has always happened while co-operating with the troops, or while laying in harbour; and it is now well known when sickness appears, that
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the best refuge is in putting to sea. Would it not then be a wise policy, for the remainder of this war, and in every future war, to blockade the islands by ships, rather than by besieging armies?

For the reasons now given, it would also be a most beneficial plan to employ hospital-ships at sea, rather than sending sick on shore. The weather in the West-Indies is generally so regular, and the sea so smooth, that no incommodioufness could happen; and small vessels might supply them with stock, fruit, and vegetables as required.

Among all the journals which we have perused, we have seen no account of any attempt to reduce the habit of body in approaching the warm latitudes: but it is a pity that it was not enforced by the highest authority at a more early period of the war. Bleeding, purging, and a reduction of the animal part of diet, with a spare allowance of wine and grog, must be the chief preparation. Dr. M'Clean* has very properly recommended men for military service in the West-Indies to be selected from the army at large, of an age beyond that which those fevers so especially attack. We should like to see this take place in the navy, for the same arguments apply, and it would be more easily practised in ships than in regiments.

* "Diseases of St. Domingo," Cadell and Davies.

The following communication comes from a gentleman who had been employed in the West-Indies at the beginning of the war, and had opportunities of seeing and hearing more on the subject of health than most navy surgeons: it is evidently the production of a mind accustomed to observation, and contains some valuable reflections on periods of sickness at St. Domingo, that have already been the matter of much discussion.

“ S I R,

“ His Majesty’s Ship Success,
Bantry-Bay, May 9th, 1798.

“ As I was in the West-Indies at the time your last Essays were published, I had not an opportunity of seeing them till my arrival in England in May last; then, truly impressed with a sense of the generous efforts you had made to render the character of a naval surgeon more respectable, and his situation more comfortable, I wished, as the only grateful return I could make, to contribute my observations: I began, and wrote the following; but after a review of them, I was not pleased with my performance: there seemed a want of something, but my abilities could go no farther. The paper has lain by me till yesterday, when I saw your circular letter: this again prompted me to send it, which I now do, and beg you will accept it as a test of my good wishes; and that, were my abilities equal to my vanity, this would have been better worth your reading.

“ October

“ October 30th, 1795. The Success relieved his Majesty's ship *Penelope* at St. Marc's in St. Domingo, and moored within a hundred and fifty yards of the shore. The town is situated nearly in the middle of a plain, about six miles in circumference, surrounded by mountains covered with wood. On the most dependent part of this plain, directly opposite the ship, was a large swamp, remaining since the preceding rainy season. This was spread over with stinking weeds covering deep mud, in which were the putrid carcases of different animals that had been neglected in the fields, from the place being in a state of blockade, and, I suppose, coming here to drink, stuck in the mud and died. The sea-breezes were irregular; the north wind most prevalent; in the night the air uncommonly cold and chilly, with heavy dews; in the day, when there was no wind, the heat was insupportable; I could not, however, precisely ascertain the degree, from the want of a thermometer. This was the state of the country and climate on our arrival, at which time we had none sick. It ought here to be remarked, that the ship was well seasoned to the climate; she had indeed suffered much from the yellow fever on her first arrival, but was now two years in the country since that death-terminating disease had disappeared. The internal discipline of the ship was the most exact and regular; the decks were washed three times a-week, when, after being well swabbed, fires were lighted in the 'twixt decks, and none suffered to go below until every part was particularly dry; but this was
not

not done except in good weather. Tuesday and Friday were washing-days; Sunday and Thursday the people were mustered clean, and the officer to whose division they belonged saw that every thing was so in their bags. If cleanliness could have preserved the health of a ship's company, it would have done so in the Success.

“ We had not been at anchor more than forty-eight hours before I fancied signs of unhealthiness were appearing among the people, when I immediately pointed out my fears and reasons for them to Captain Pigot, begging the ship might be removed from her present situation; but this was impossible from the nature of the place, as there only we could contribute to the defence. This was told me with unfeigned sorrow by our worthy captain, whose feelings, and whose humanity, were always interested in the relief of the sick *. At the end of eight days three complained, with regular symptoms of intermittent; after this, one or more were taken ill daily. In those first taken the symptoms were mild, and yielded readily to emetics and bark; but every day the disease seemed to increase in virulence; and the longer the people escaped, the worse when taken; for by the begin-

* Our readers will be concerned to learn, that this accomplished young officer fell a victim to the horrid mutiny that afterwards broke out on board the *Hermione*. The crew consisted in a great part of foreigners: the ship was carried to an enemy's port; and some of the murderers have since suffered for the crime in England.

ing of November it had put on the appearance of the bilious remitting fever common to the West-Indies, and described by Dr. Jackson in the diseases of Jamaica. For this change I could account no other way, than that the more the watery parts of the swamp were exhaled, the stronger the miasmata or effluvia became. About the 16th of December I was seized with the fever, and was unable to do any duty for two weeks, during which time nine perished in the most miserable manner, without the least assistance. I had no mate, and there was no medical help to be got from the shore, for there they were in a worse state than we.

“Before our arrival, as well as during this period, the troops on shore were daily dying of the yellow fever, particularly the 96th regiment; but this was before our sickness, and the contagion could not have originated with them, as we had no communication. Might not the fever on shore and that in the *Succes* originate from the same cause? Might not the effects of the marsh miasmata have been somewhat modified in the passage to the ship? for bad as the fever was, it was not near so fatal as that on shore. Twenty died out of one hundred and fifty that were afflicted in the *Succes*; but on shore, I can venture to say, every second man who got the fever died.

“The symptoms have been so often described, that I can offer none I observed to be uncommon. The fit was, in general, ushered in by chills and heats; the exacerbations were irregular. (Should you wish a journal of some of the cases, I will with pleasure

pleasure send it.) On the first complaint, I gave a weak solution of tartar emetic with ipecacuanha every ten minutes, till it procured a full and free vomiting: if it had not the effect of also opening the bowels, I threw up an injection of common or Glauber's salts. When the operation of this was over, I had the patient's legs immersed to the knees in warm water, into which I put a quantity of vinegar; but I did this with no idea of revulsion, but because it was grateful to the patient, seldom failed of opening the skin and bringing on a general perspiration, which relieved the headache, and often procured a favorable remission; during which I gave as much of the bark as the stomach would bear in a variety of forms, suited as much as I could to the inclination of the patient; but there were many whose stomachs could not bear the bark even in the most delicate form. Irritation at stomach was the most dangerous and perplexing symptom I had to combat; to alleviate which I had recourse to all the various remedies I had seen used, and even to them I had read of. Saline draughts in a state of effervescence I never found any way useful: the tinct opii answered in some cases, but was uncertain in its effects. Blisters applied to the epigastric region, and removed when they had caused inflammation without blistering. I took them away at this time, as I found if they had not now allayed the irritation, they never did it after, and when allowed to cause blistering, they produced troublesome sores, on which it was difficult to keep dressings in a restless fever patient,

patient. Æther I found of service, particularly in hiccup; but what proved more serviceable than every thing else, were draughts of cold water, which were eagerly desired by the patient, and drank with avidity, an indulgence of which I never saw attended with bad effects. Cold bathing was eminently serviceable in putting a stop to vomiting: this last, however, appeared so contradictory to the ideas of sailors, that I had much to combat from their prejudices. "Putting a man with a "hot fever," as they expressed, "into a tub of "cold water," seemed to them an unprecedented and extraordinary thing; and it was not till they saw the good effects of it that they could be persuaded. The only drink I could procure was common water acidulated, and sweetened with sugar. Plenty of balm grew in the neighbourhood that made also a grateful drink, of which many were remarkably fond, and indeed attributed to it their recovery. On observing the least symptom of debility, I supported them with wine, plenty of the best Madeira being then in the ship, to which, no doubt, many owed their lives.

"In the beginning of the intermittents (which were of all types) I also gave an emetic, and repeated the same as I judged from symptoms. There were an accumulation and absorption of bile from the stomach, which were often particularly pointed out by the yellow appearance of the skin and eyes, that I have seen disappear in an extraordinary manner after the operation of an emetic, which convinces me that an emetic is often useful in more ways

ways than merely evacuating the contents of the stomach, as has been contended for by some. Opium, given an hour previous to the accession of the cold paroxysm, always mitigated, but I cannot say it ever prevented or cured one case of the disease; but I never trusted to it alone, my chief dependence being on the bark. On the — of January, the apprehension of an attack being done away, we went to sea, and continued cruising off the harbour four weeks, during which the disease gradually *disappeared*, and all got well but five, who had dropical swellings, and were sent to the hospital at Cape Nichola Mole.

“ February. We anchored in our old place; but I found the swamp was nearly dried up, the weather was also more mild and equal, the sea-breezes were more regular, and the night dews not so heavy; from which I was in hopes we should now be healthy, but I was deceived; for in three days dysentery made its appearance, and very soon became epidemic, though never so much so as the former: for this I could not account unless as the effect of the former disease. The first symptoms were headach, sickness at stomach, with twitches in the bowels; these symptoms were the most general; but in others it attacked at once with bloody stools, violent griping, and tenesmus. With the first I began by an emetic, if this had the effect of opening the bowels, as well as emptying the contents of the stomach, it seldom failed of giving relief; indeed, frequently it produced a cure. For the latter I gave an ounce or ten drams of the

sal glauber; if they operated freely, I gave an anodyne at night; if the cathartics did not relieve the griping and tenesmus, I continued them three or four days, but never the salts after the second day, as I was afraid their too strong cathartic powers might deprive the intestines of their mucus, and thereby leave them more liable to inflammation; I preferred the more mild, such as the p. rhei. ol. ricin. &c. with the anodyne at night; but this practice had not always success, the griping, bloody stools, and tenesmus continued; for the relief of which I tried various remedies. Pills of ipecacuanha with opium I thought hurtful, by disordering the stomach: spec. scord. opio. pulvis, and tinctura terra japonica, ext. lig. camph. confect. oniak. I gave respectively a fair trial, but only found them useful according to the quantity of opium they contained: I can say so much of the above medicines from self-experience; for, to what remedies will not the wretch fly, who is tortured by this cruel distemper? The warm bath and warm fomentations always gave a temporary relief; but I thought they tended to weaken the patient when too often repeated: a pill composed of three grains of calomel, with four of asafœtida, given every four hours till they had freely opened the bowels, did great service by expelling the flatus and relieving the tenesmus; they not only had this good effect, but frequently brought away a number of round hard lumps, the expulsion of which gave instant relief, and I thought it a great step towards the cure. Glysters composed of thick rice water,
into

into which I dissolved two drams of asafoetida, and a dram of opium thrown up frequently, relieved the tenesmus, and often completed the cure. During the course of the disease I gave wine, and as nourishing a diet as I could procure, except in two or three cases, where the symptoms of inflammation were so high, as to render it obviously imprudent. I remarked, that in those who, when ill of the intermittents, had refused the bark, the disease seemed to be particularly obstinate. It was but few I could venture to bleed, although the indications of flushed countenance, full throbbing pulse, were prevalent; the reason was, that most afflicted had been previously weakened by fever.

“ You will readily imagine that these complaints, with a want of vegetables and fresh meat, produced a tendency to scurvy; this was the case: no pen can describe the melancholy state of his Majesty’s ship Success during the nine months she lay guard-ship at St. Marc’s. This disease, however, arrived at no great length; the symptoms went no farther than spongy gums; some had contracted hams, and effusions of blood under the skin, others the dysenteric complaints continued with, the obstinacy of which I attributed to this disease. About a fortnight after I first observed the symptoms of scurvy, as if by the interposition of Providence, a Spanish vessel arrived from Cuba with stock, and several barrels of limes, two of which I purchased: to them the scorbutic symptoms easily gave way; all recovered but one, who died suddenly on getting out of his hammock. June the —, we were
relieved

relieved by his Majesty's ship Quebec, and went to Jamaica, where fresh meat and vegetables restored the ship's company.

" I feel that I have not abilities to make this subject sufficiently interesting, and am afraid I have already taken up too much of your time ; but you will excuse me, and believe my intentions are with a view to relieve the afflicted. Under this idea I beg leave to detain you a few moments longer, to offer some remarks on the Yellow Fever, when it prevailed in Commodore Ford's Squadron at Port-au-Prince.

" Previous to the Squadron appearing before that place in May 1794, I knew of no ship afflicted with any contagious disease ; some of them indeed had lost men, but, as far as I could learn, that was by the common remittents of the country. On the capture of this port, June the 4th, 1794, about forty sail of merchantmen were found in the harbour, most of them large vessels, the cargoes of which were coffee, cotton, sugar, and indigo, that had been stowed in them from one year to three, in which time many of them never had their holds opened, from the disturbances that prevailed among themselves. On board of them, men were sent from the whole Squadron, to fit them for the passage to Jamaica, which, from the state they were in, was not to be soon done. The weather was excessively warm, and some days elapsed without a breath of wind. The very first day the people proceeded to work, many were taken ill, and sent on board their respective ships with fever ; several with strong convulsions that were succeeded

by fever, and one or two died. I was sent to several to remove the sick, where I found the stench from the damaged coffee and sugar almost unsupportable: it wanted no great degree of penetration to prognosticate the consequences in two, where there was a quantity of sugar, &c. melted in the hold *. I saw the mixture in an actual state of effervescence, and bubbling up from every part. From these ships I can vouch the disease was first introduced to the Penelope. I most truly think that the primary cause of this horrid disease originated from these ships: one thing is most certain, that if it did not originate there, it was much increased in virulence by our connection with them. After they were fitted out, on their passage to Jamaica they lost more than three to one in comparison with the men of war, although this passage was not more than seven days. In the Horizon, on board which was Lieutenant Gueren, and Mr. Stupart of the Europa, the crew had been replaced three times, and from illness got in her, died thirty men: seven out of ten died on the passage to Jamaica; another of them was picked up at sea by a Guineaman, with every soul dead on board; even a number of negroes, who afterwards cleared them, died from fevers caught on board them. There was a remark I made without being in any way able to account for the cause,

* We still think, as mentioned in our former volume, that the mortality here was occasioned by fixed air (carbonic acid gas), and that the disease was *suffocation*, either instant or lingering, and *not* fever.

that a person should in one ship, equally bad with the others, there resist the disease, yet on coming to a strange ship, he was almost immediately seized by the contagion. I saw this particularly exemplified by visitors, and by the frequent change of officers and men that happened in the flag-ship. On board every ship even at the time the yellow fever was most fatal, there was a number of intermittents appeared, from which I am of opinion that intermittent fever may be caught, but not communicated by contagion. I mean that contagion may be received from a person labouring under typhus or yellow fever, yet the disease produced by that infection may be intermittent, which intermittent cannot spread the contagion received; or why should both diseases be in the same ship, when the original cause producing them was the same?

“ I had intended to have given you a sketch of the various methods of cure adopted by the different surgeons, but am afraid I have intruded too far already; if you, however, think I can give any information, I shall be happy to continue the subject. I am, with the greatest respect, Sir,

Your most obedient servant,

JOHN CRAWFORD.”

P. S. Jan. 12th, 1799.

IN our former volume, under the article Yellow Fever, we had occasion to mention the *Dædalus* frigate, Captain Countess, as a striking example of the good effects to be obtained from a colder

latitude, in completely subduing the disease. We have just been favoured with some valuable remarks by Mr. T. Downey, surgeon of the *Ethalion*, who acted in the *Dædalus* on her passage to Halifax and England, after the death of her surgeon.

Mr. Downey does not mention the name of the ship he had been employed in, on the Jamaica station; but it appears that the fever had prevailed among the crew, and that he himself was a sufferer. Having relapsed, and being extremely reduced, a voyage to a colder country was deemed the only chance for the recovery of his health. His account of the symptoms in the different stages does not materially vary from that of others; it confirms the universal opinion, that this fever, in its attack, is attended with every sign of the most violent excitement, and such as has never occurred in any inflammatory affection of the temperate zone. Blood drawn from the veins gave the appearance of a high degree of oxygenation. He says, "Blood taken from the veins immediately
" on the patient being seized was usually of a
" florid red, moderately firm in its texture, and
" very seldom fizy; but when bled at a later
" period, the blood appeared fizy. Some that
" was taken on the third day, which was the third
" time that venæsection had been performed, was
" covered with a very thick yellow-tinged *buff*,
" the crassamentum being *cupped*, as it has been
" called, and withal exceedingly firm and solid:
" the size in the two former bleedings was not
" observed."

The

The atmosphere of all warm climates probably possesses a larger proportion of oxygene than that of our more northerly latitudes; and there may be some peculiarity of constitution in unseasoned Europeans, that disposes their blood to receive a greater quantity of this stimulus, and which may favour the disease in question. The seasoned European, the native white inhabitant, and all the people of colour, to the deepest black, who have resided in the islands, are observed to be secure against the yellow fever: or if they become affected, it is from causes which are common to them with the new-comers from the northerly regions. The fallow looks and complexion of these people certainly show that their blood is not so florid, and consequently less oxygenated, than those who are subject to this endemic: and this fact clearly points out and confirms what has been most successful in the prevention. This also strongly elucidates the theory of Dr. Mitchill, whose prophylactic means entirely correspond with the most approved experience on the subject. His doctrine does not supersede what has been thought the best practice, and while it rather confirms it, has added other assistants that were before employed with doubt and hesitation, because there was no principle established to direct their application.

Particular spots of soil, and especially swampy districts of country, give out those pestiferous exhalations which so singularly affect the human body; and as we recede from the places where

they are evolved, we in proportion avoid the poison. In other words, they are too much diluted to be hurtful; or they excite diseases neither so acute or fatal. Mr. Crawford remarks, that though the mortality was great in the *Success* frigate, while she lay at anchor, yet, it was by no means so great as among the troops on shore, who died in a larger proportion of those that were seized. It is, perhaps, of little consequence in practice, whether we attribute this difference of the condition of marsh miasma to its less concentrated state, by diffusion in the atmosphere; or to its miscibility with the water as it passed from the shore to the ship, which thus rendered it less noxious by abstracting a part. But to return to Mr. Downey's method of treatment:

The two first cases which occurred he thus treated: " I gave one person calomel, and from
 " another I took about sixteen ounces of blood.
 " In the first case I did not find that relief I had
 " been taught to expect; the calomel neither
 " running off by the bowels, nor affecting the
 " salivary glands. I had not then ventured to
 " give so large a dose as Dr. Chisholm recom-
 " mends, nor to repeat it so often. But as the
 " patient passed over three days without any, very
 " dangerous symptoms supervening, I persisted in
 " its use till 150 grains were taken. No other
 " effect followed, than the pulse becoming more
 " soft and slow, which before had been quick and
 " contracted: the skin also, which, previous to
 " its use, had been hot and dry, became more
 " soft;

“ soft ; but the patient lay in a state little better
 “ than comatose three days longer. He was
 “ removed on shore, where he recovered, a plen-
 “ tiful salivation taking place as the symptoms of
 “ fever declined.

“ The other patient, from whom blood was
 “ taken, soon felt an abatement of the pain in his
 “ head : and in an hour after he was bled he
 “ took pulv. jalap. ℥ij. calomel gr. x. M. This
 “ procured nine or ten evacuations, and the next
 “ morning he seemed free of complaint. I did
 “ not, however, so far trust to appearances as to
 “ neglect giving him purges on the two following
 “ days. The event of this case gave me great
 “ satisfaction ; and as I was yet to experience the
 “ effect of the calomel, I put every one, of whom
 “ I had the entire care, under the plan of eva-
 “ cuation by *bleeding and purging*, till an attack
 “ of the fever compelled me to beg the same assist-
 “ ance at the hands of others.

“ Out of one hundred and thirty cases which
 “ occurred, previous to my illness, the ter-
 “ mination of one only was fatal, where the
 “ treatment above-mentioned was fairly carried
 “ into execution. I say fairly, for in one instance
 “ only besides, that had the same event, the
 “ patient was not bled till the fourth day of the
 “ disease ; the evacuation evidently hastened his
 “ dissolution. After my recovery, and before
 “ I was capable of returning to regular attend-
 “ ance on the sick, I saw such striking instances
 “ of the inefficacy, and also of the baneful effect

“ of *partial evacuations*, or the want of persever-
“ ance in their use, and steadiness in the mode of
“ conducting them, that I was induced to pause
“ in my favourable opinion of this mode of
“ treatment, and to endeavour carefully to ob-
“ serve, whether the disease itself was not about
“ to undergo an alteration in its nature.

“ I sailed from Jamaica with the convoy for
“ England; and in the course of the passage to
“ the Gulf of Florida, which was extremely slow
“ and tedious, the squadron was very sickly; in
“ particular the *Dædalus*, on board of which ship,
“ though then exceedingly weak, I went in conse-
“ quence of the illness of the surgeon, who died
“ the next day. On inquiry I found that calomel
“ had been used as the principal remedy; but the
“ stock with which they left Jamaica having been
“ exhausted, they had for several days depended
“ on scanty and precarious supplies from the
“ different ships of war *. I once more ventured

* I am afraid this has been too much the case with many other ships during the war. No private individual can be supposed to carry abroad a chest of medicine equal to such expenditure as has occurred during the rage of yellow fever in a ship. The partial supply which is now granted has not half remedied the evil: there must be a radical change in this whole business, and every article of medicine ought to come from a public stock; not by stated allowance, but as sickness and disease shall render demand necessary. I have no patience in contemplating such a cold-hearted practice of physic as this, that pauses with extended alms, and hesitates to do a kind action.

“ on

“ on the evacuating plan, till from the want of
“ purgative medicines I was obliged to have
“ recourse to calomel. It was part of my daily
“ employment to procure this medicine, even
“ from the merchant-ships under convoy; from
“ which we received it in the small portions
“ of $\mathfrak{z}\text{i}$, $\mathfrak{z}\text{ij}$, and $\mathfrak{z}\text{iiij}$, at a time, and of course I
“ was hindered from giving it in such doses as
“ were most likely to insure success. Yet the
“ event was beyond my expectation; four people
“ only dying on board the *Dædalus* out of forty-
“ five, exclusive of six relapses, making the ag-
“ gregate fifty-one. Of these twenty-eight were
“ treated with V. S. and purging, and one died;
“ of twelve treated with calomel from the begin-
“ ning, two died.

“ Having, in some of the first cases where I gave
“ this medicine, observed that a large quantity
“ might be taken without procuring stools, I
“ gave to the patients in the *Dædalus* a dose of
“ salts in the first place, and after three or four
“ stools entered on the use of calomel: in this
“ manner the medicine seemed to act with greater
“ certainty.

“ The usual consequences of bleeding were an
“ abatement in the pain of the head, stomach,
“ and loins. Though the pulse had no great
“ degree of hardness or fullness, and though the
“ patient was often liable to faint on the loss
“ of four or five ounces of blood, yet these circum-
“ stances did not in any case deter me from carry-
“ ing on the evacuation, to twelve, sixteen, or
“ even

“ even twenty ounces, if the pain in the head
“ was very violent. The evacuating medicine
“ having operated briskly, scarce any pain re-
“ mained ; but in general, on the next morning,
“ some giddiness was complained of, which was
“ relieved by another dose of calomel and jalap,
“ or salts ; the same medicine was repeated on the
“ third day, or on the fourth, if the patient was
“ tolerably free from complaint on the third. In
“ many the disease required bleeding two or three
“ days successively, or even twice in the twenty-
“ four hours, as the pain of the head or region of
“ the stomach was more or less disposed to give
“ way ; and the evacuations by stool were always
“ kept up in proportion to the bleedings.

“ In relapses which occurred, at the end of
“ seven to ten days, or later, the same mode of
“ treatment was used ; and though it was not often
“ necessary to carry it to the same extent as at
“ first, yet the good effects were equally visible.

“ Notwithstanding what has been said here, I
“ am free to confess, that I do not consider the
“ instances I have seen, that the disease appeared
“ in its most violent form. We had none seized
“ with those dreadful paroxysms which Dr. Chis-
“ holm describes in his account of the fever which
“ prevailed at Grenada. I should suppose it held
“ a middle rank between the violent forms of at-
“ tack, in which it sometimes invades the human
“ frame, and that slow insidious approach, wherein
“ the commotions which it occasions in the system
“ are so small as at the beginning easily to pass
“ unob-

“ unobserved. Several instances of this kind came
“ under my inspection, and are perhaps the most
“ dangerous form of the disease, as, before we are
“ aware of its existence, the time for acting with
“ effect is elapsed.

“ A reliance on the bark in this disease, when
“ given either at the onset or during a remission,
“ has, I conceive, been productive of much mis-
“ chief. Valuable as this medicine certainly is,
“ can it be indicated, where both the symptoms
“ and dissections mark a state of the viscera in
“ which inflammation prevails early, but particu-
“ larly in the stomach; and which, even in the
“ fevers of our own climate, would render its
“ exhibition useless? That there was a *fair remis-*
“ *sion* procured so early as the evening of the first
“ day, in many cases, is not to be disputed: the
“ next day, on a return of the leading symp-
“ toms, the same remedies were used, and another
“ remission followed as perfect as the former. No
“ advantage was taken of this to throw in the
“ bark; but by continuing the same plan of
“ treatment, viz. a repetition of V. S. the second
“ day, with purging the first three or four days,
“ or later, if the symptoms were not entirely gone
“ off, the remissions became at length so complete
“ as to end in a perfect recovery: and the facility
“ with which the fever was subdued, under this
“ simple mode of practice, would have almost
“ induced one to doubt of it being the same dis-
“ ease which a few days before was carrying off
“ the ship’s crew in the proportion of one in every
“ three;

“ three; twenty-seven men having died out of
“ seventy-one, who were taken ill previous to my
“ joining the *Dædalus*, and this too in the short
“ space of three weeks.

“ If the opinion that the original character of
“ this disease is inflammatory, be well founded,
“ the greater violence of the attack will only indi-
“ cate a more diligent use of the evacuations here
“ recommended; as the early or later approach of
“ the putrescent stage is certainly in proportion.
“ But even in the mildest forms of the disease, the
“ bold and decisive application of these remedies,
“ and the continuance of them, more particularly
“ the purging, even for three or four days after the
“ symptoms shall have ceased, is absolutely neces-
“ sary. The disease during the first two or three
“ days by evacuations will appear to give way, and
“ to be subdued; but the complaints have a constant
“ tendency to return; and it is only for them to
“ be neglected a day or two, when they will to a
“ certainty prove fatal. Nothing, therefore, less
“ than a full conviction of the patient being fairly
“ out of danger, and free from fever, could induce
“ us to lay aside the proper remedies.

“ It often happens that the men neglect to ap-
“ ply to the surgeon, till the disease has been some
“ time present, especially when the symptoms are
“ heaviness of the head, and the stomach but little
“ affected. They find themselves not so ill as to
“ think it necessary to quit their duty, but in the
“ course of performing it, are often obliged to lie
“ down, more particularly in the night watches:

“ and

“ and the first notice I have had of many men
“ being under the influence of the disease, was,
“ that while walking the deck in their watch,
“ they stopped, and frequently laid their heads on
“ a gun for some minutes. In these cases a very
“ material question occurs, as we are required to
“ attempt drawing a line, when bleeding and
“ purging may be used with effect, or when a
“ preference may be given to mercury. If I had
“ my choice of the two modes of practice, and
“ the patient should make his first application
“ within the first two days, I should not hesitate
“ to prefer evacuations. On the third day much
“ must be left to the judgment of the practitioner ;
“ but after this period, perhaps in the afternoon
“ of the third day, I would rather trust to ca-
“ lomel. As also in case the evacuating remedies
“ used from the first should fail of success, the
“ relief afforded by these is generally so very vi-
“ sible, that a little practice will enable us to judge
“ when their continuance is likely to be availing
“ or not. Therefore, if after a *fair trial* given to
“ evacuations, within the first two days, the symp-
“ toms shall not have greatly subsided, but parti-
“ cularly if the affection of the stomach should be
“ present with great tendency to coma, I should
“ consider this medicine a *sheet-anchor*, if any
“ article in the *Materia Medica* can be worthy
“ such an appellation : and I have seen such in-
“ stances of recovery from states so apparently
“ desperate, by its use, that I should always con-
“ sider it worth submitting to a trial. We cannot
“ stamp

“ stamp a due value on our remedies by the num-
 “ ber of recoveries alone ; the escape of a single
 “ person from some of those dreadful situations,
 “ which occur in the course of West-India practice,
 “ tends to shew the value of the treatment more
 “ than that of ten patients, who apply imme-
 “ diately on being taken ill.

“ In those desperate cases, however, every mo-
 “ ment is to be made the best of ; and consider-
 “ ing that nothing can be lost, the medical at-
 “ tendant, guided by rational views in the choice
 “ of his medicine, is justified in putting it to the
 “ utmost extent in point of quantity *.

“ With respect to the operation of the reme-
 “ dies here recommended, I do not know how far
 “ their effects will be allowed to act on the ab-
 “ sorbent system. The influence of mercury on
 “ this series of vessels, we can readily perceive ;
 “ we know also they will not be lightly affected
 “ by the use of evacuations, producing the effect,
 “ perhaps, that Sydenham meant to express when
 “ he spoke of *cooling the body*. And it is possible,
 “ that in this manner the fever at Gambron, men-

* “ A gentleman of long practice in Dominique assured
 “ me, that at a late period of the disease, the patient then
 “ labouring under the symptoms of black vomiting, and
 “ every other appearance portending speedy dissolution, had
 “ given calomel in the dose of one dram ; and the patient
 “ recovered after an enormous discharge of almost black
 “ fæces. The same gentleman informed me that the black
 “ vomiting in another case was stayed, after suffering the
 “ patient to drink as much new milk as he pleased.”

“ tioned

“ tioned by Sir John Chardin, was cured; in
“ which the practice was to pour cold water on
“ the surface of the body, while purging was kept
“ up at the same time.

“ Does the dashing of cold water on patients,
“ in this fever, in cases where it is successful, ex-
“ cite the animal powers to actions, tending to
“ restore a proper balance in the lymphatic sys-
“ tem, and thereby obviating the fatal tendency
“ of the disease?

“ It is with much pleasure I mention the salu-
“ tary effect of a colder temperature. It was first
“ instanced in the fresh names on the list be-
“ coming every day less in number. And after
“ we had bore away for Halifax, in the last five
“ or six cases who were taken ill, the symptoms
“ were so mild, that they required purgative me-
“ dicines only. I have not, therefore, included
“ them in the number of sick above-mentioned,
“ in the *Dædalus*; the greatest part of whom
“ were seized in the Gulph of Florida, or in the
“ course from Jamaica to that place.”

It is now to be observed, from this narrative,
that Mr. Downey's treatment of the yellow fever
is the best epitome of Dr. Moseley's practice that
we have yet seen. He is also strongly impressed
with the advantage of the mercury in large doses,
according to the example of Rush and Chisholm,
and some wonderful recoveries seem to have given
rise to this partiality for a medicine that, setting
aside its purgative effects, appears to have been
exhibited on very vague principles, in the hands

of the two physicians who first inculcated its administration in this fever. The disease disappeared almost at once off Halifax; and is not this a plan that ought always to be imitated when our ships become sickly in the West Indies? Captain Countess, who commanded the *Dædalus* during this affliction of three parts of her crew, was so kind and condescending as to give up his whole cabin to accommodate the sick; by which means every advantage was gained that could be obtained from a pure cool air, cleanliness, and all other tender offices so necessary in a trying situation. A deed of this kind reflects so much lustre on the naval character, that it is impossible to withhold the mention of it; and I think that officer knows me too well to suspect that I can act the part of a flatterer here.

MEDICINA NAUTICA.

THE SMALL-POX.

WE have remarked, in our former volume, the very frequent occurrence of Small-Pox in his Majesty's ships, by infection imported by means there stated. Fresh instances having come under our knowledge, we think it of sufficient importance to resume the subject.

The Queen Charlotte, as reported to me by Mr. Caird, carried the contagion to sea, in the cruize with Vice-Admiral Colpoys, in November and December 1796. This infection was distinctly traced to a man who had just come from Haflar Hospital, and was first taken ill. Of this disease, at that time, eight cases occurred during the cruize. The small-pox were chiefly of the distinct sort; and only one died, a boy. This ship had the disease on board several times before; and there were not now many who never had the infection: but from having the advantage of a third deck, and the utmost attention being paid to keep the sick from the healthy, it was confined to a few subjects.

In August 1797, the small-pox appeared on board the Mars at sea, of the confluent kind.

This afforded me an opportunity to make some proposals to the Lords Commissioners of Admiralty on the business, which was done in the following letter:

“ S I R,

Medusa, Torbay, Aug. 29, 1797.

“ I beg you will be pleased to submit the following proposal to their Lordships’ consideration.

“ The small-pox having lately appeared in the Mars, the contagion had been communicated in the following manner, as reported to me by the surgeon’s mate. John Jones, a cook’s mate, was sent to Haslar for another disease: in one of the beds where he lay, he complained of the offensive smell of the sheets, and they were changed next day. In the mean time he recovered, and was sent to his ship; and after being a few days at sea, the small-pox appeared, of the confluent kind, and he died soon after the eruption. Samuel Herbert, another cook’s mate, who lived with him, was quickly infected; but on his case being reported to me, he was immediately moved to the Medusa. He died on the third day of the eruption, which was confluent. On the ship’s company being mustered, there were found fifty seamen, eight marines, and a boy, that never had the disease. They refused inoculation: but there are some hopes, from the timely separation of the last case, that the contagion is overcome.

“ This

“ This is one of many instances which have occurred during the war, of the variolous contagion being spread from the hospital. The hazard that the lives of individuals, and the purposes of service, are exposed to, in consequence, sufficiently warrant our investigation. We see that a large proportion of the Mars’ people have not passed the disease; and I apprehend, upon an average, the same number will be found in other ships. The experience of former wars has not been exactly detailed for our guide or information; but I suspect that it had been attended with great mortality from small-pox. In the present war, from the enemy being beat from the face of the sea, the danger has been comparatively small, as it has given ships the opportunity of being cleared. But sound policy and a recording practice of physic ought to think for posterity, and furnish them with the means which our knowledge and observation have given us, in order to alleviate the hardships of a sea-life, and prevent similar evils.

“ During the short period of my attendance at Haslar; many cases of small-pox appeared in different wards, which, though the infection was traced with difficulty, it was decidedly proved to have taken place within the walls. Had these patients not sickened before leaving the hospital, the contagion must have spread in the ship, as we have seen it in the Queen Charlotte, Orion, London, &c.

“ It was a fault in the construction of the Naval Hospitals to admit this disease within the roof with

other patients. So subtle is its nature, and so easily is it conveyed, that the clothes of a person in health will carry it from a sick chamber, and affect others at many miles distance.—(*Vide* MED. NAUT.)

“ For these reasons and for many others, too minute to be detailed here, I beg leave to suggest to their Lordships some building, to be constructed at a sufficient distance from the hospitals, solely for the reception of Small-Pox, with kitchen, *wash-house*, &c. entirely confined to this institution.

“ From the long experience which I have had of their Lordships’ attention to the subject of health in the fleet, I need the less apologise for troubling them now; and I have embraced the opportunity which a recent infection in the Mars has added to former observations. I have the honour to be, Sir,

“ Your most obedient and humble servant,

“ T. TROTTER.

“ To EVAN NEPEAN, Esq.”

My proposal received due attention from their Lordships, and was submitted to the consideration of the Commissioners of Sick and Wounded; and their report was transmitted to me, which was briefly, that they did not see any necessity for a small-pox ward at a distance from the other hospitals. A subject of such moment had a claim to all the attention that could be given it; and the evidence which we have produced appears to us convincing. We think that a small building in the most retired part of the hospital-ground at

Haslar

Haslar and Plymouth, a small area round it for the benefit of convalescents, with a kitchen and wash-house, to cut off all communication with other patients, might be erected for a trifling sum.

Some improvement, however, took place in consequence of this representation. A door communicating with the common staircase of other wards was built up: but let any person consider the facility with which this disease is imported, and let him examine the situation of small-pox wards at these hospitals, and he will not fail to think as we do. The back windows of the ward at Haslar front those of other wards, and the space is not many feet distant for a current of air to convey infectious matter. When we, in the fleet, have so often followed up its source to the hospitals; is it not likely that it also is carried from them to the neighbouring towns, and kept constantly alive. We moreover contend that it is inconsistent with the spirit of medical jurisprudence to admit the small-pox infection within an hospital with other diseases, to whom it is liable to be conveyed; we therefore choose to *record* the fact, that it may benefit posterity. “If Rome must fall, we are innocent.”

The timely separation of the infected subject, by moving him to the Medusa, saved the people in the Mars. The brave crew of that ship were reserved for a happier fate. In the spring following they chaced from the fleet and came up with L’Hercule of 74 guns, which ship was obliged to anchor on account of the tide, and after an obsti-

nate resistance, during which the Mars attacked her opponent so close as to unhinge her own lower-deck ports, the Frenchman struck. In this conflict the gallant and worthy Captain Alexander Hood fell, with a number of his people, than whom a better man never bled on the deck of honour!

The following extracts are taken from a letter of Mr. Peter Cullen, surgeon of L'Espion frigate, in the North Sea, to Mr. John Leggat of Le Puissant, at Spithead, dated April 9th, 1797, and by him communicated to me. They are of a practical nature, and may be useful to others. L'Espion imported the small-pox at Yarmouth.

“ It appeared first in one of the boys, who had
“ slept two nights on shore: he had an immense
“ load of them, of a bad kind, and he died on
“ the eleventh day. The disease was not ascer-
“ tained nor even suspected till the eruption ap-
“ peared. From the violence of the eruptive
“ fever he was confined to bed; and, supposing
“ it a common fever, I was prevented from using
“ the strict refrigerent plan, which you know is
“ more or less effectual, in proportion as it is
“ employed before the eruption. As soon as the
“ disease was known, I had him instantly removed
“ under the half deck, and gave warning to such
“ as never had the infection, (who were to the
“ number of seventeen,) to avoid all near com-
“ munication with the infected. I immediately
“ proposed the inoculation, but the captain, afraid
“ of weakening his ship, objected to it till we
“ came

“ came into port ; and wished only for means to
“ be taken to prevent its spreading. He was
“ therefore kept separated, and all communication
“ prevented ; and after his death every thing he
“ had was thrown overboard. The sick berth
“ was well scrubbed and washed with warm water
“ and soap, the ports opened on each side, and
“ fires lighted. The infection did not make its
“ appearance again till a day or two after our
“ return to Yarmouth. But it is still a query
“ whether it might have been prevented by the
“ means used, and our staying at sea ; or going
“ to another port where there was no risk of
“ getting a fresh infection. From the analogy of
“ a town, house, or hospital, where it will be pro-
“ pagated in spite of all precautions, I am disposed
“ to think that there is no eradicating that specific
“ contagion ; that all we can do is, by early ino-
“ culation, to moderate it only. And if I mistake
“ not, these are also the ideas of most of our pro-
“ fession, and of our worthy physician Dr. Trotter.
“ When you have an opportunity, be so good as
“ ask the doctor, whether or not an early ino-
“ culation should be practised in ships at sea, where
“ there is no hospital-ship, and not to trust to
“ means of prevention ? The doctor approves of
“ immediate inoculation, where there is access to
“ an hospital or hospital-ship ; but what is to be
“ done otherwise ? I have inoculated seven out
“ of the seventeen, and four have been sent on
“ shore with the natural infection : the others
“ would not submit to inoculation.”

In vol. i. p. 388, MED. NAUT. our opinion is given clearly in favor of immediate inoculation. We do not think inoculation can much weaken any ship's company, if the whole were inoculated at once that we have ever found uninfected in one ship. The disease under the usual circumstances has uniformly been so mild, that the patient has never been confined to bed more than in health. There have, no doubt, been instances of a single case recovering on board, without infecting others; but we know no certainty of imitating this, and the hazard otherwise is so great, that no time ought to be lost in giving the seaman a chance of escaping the natural small-pox by timely inoculation.

In the course of last summer, four ships of the line had, by different means, imported small-pox. The *Triumph* received it from a woman attending the ship in May, at Torbay, who came out of a house where the disease prevailed; and from her clothes a boy was infected. It appeared just as the fleet was going to sea, and Sir A. Gardner ordered a cutter to carry the boy to Plymouth Hospital, so as to prevent the further progress *. In August, a man sickened on board the *Queen Charlotte*, and when his case was found to be small-pox, was immediately ordered away by Sir C. Thompson, in *Cawland-Bay*. In October, the *Russel*, while in *Hamoaze*, was cleared, by sending to the hospital the first infected subject that appeared.

* The same ship imported the infection at Spithead in December last, and was cleared with equal success.

It is necessary to mark the circumstances attending particular instances of infection, that the fact may appear more striking, and our means of prevention more correct and secure.

The contagion on board the Captain became more serious ; as explained in the following letter from Mr. Farquhar the surgeon.

“ On board his Majesty’s ship Captain,
off Brest, 17th Aug. 1798.

“ SIR,

“ I had the honor of receiving your letter of yesterday’s date, requesting to know how the variolous contagion was received on board this ship ; what progress it has made among the people ; and what steps have been taken for the security of those who never had the disease.

“ In answer to which, I have to acquaint you, that the infection was undoubtedly brought on board from Plymouth-Dock, as the small-pox made their appearance on Ph. Park, one of the seamen, (on the 4th June last,) only two days after our sailing from that place, where the disease was at that time epidemic. On the 19th June, another of the seamen was seized with them ; both of whom were landed at Plymouth Hospital on the 21st, the ship having put into port principally on this account. We again left Plymouth on the 25th of June ; since which time eleven of the ship’s company have been seized with the disease at different times ; four of whom, I am sorry to
add,

add, have died, all of them being loaded with the confluent small-pox of the worst kind. There are at present four on the list, who are all doing well. The steps which have been taken for the security of those who have not had the small-pox, are, removing the patients into the sick berth under the fore-castle, as soon as the disease makes its appearance, where they are entirely separated from the ship's company, and where proper sentinels are placed to prevent any communication being had with them; washing and fumigating all the clothes, bedding, &c. of those who recover, previous to their returning to their duty; and taking care to prevent any of those who have not had the disease from sleeping near them.

“ Every attention has been paid to keeping the patients as cool as possible, the sick berth, besides being kept dry and clean, has been regularly fumigated twice a-day with the nitrous gas. The whole ship is kept very clean, frequently fumigated, and as dry as circumstances will admit of.

“ I cannot help regretting that the man who was first seized with the small-pox, was not immediately removed from the ship, application having been made to the commander in chief for that purpose by Captain Aylmer: had that been the case, I think it is very probable that the disease would not have again made its appearance. There are between forty and fifty of the seamen who have not had the small-pox.

“ Should

“ Should any thing occur to you, which you think will tend to prevent the farther progress of the contagion, I beg you will do me the honor of communicating it. I am, Sir, with the greatest respect, your most obedient and very humble servant,

“ JAMES FARQUHAR.

“ T. TROTTER, Esq.
Physician to his Majesty's fleet.”

For the reasons just narrated, this disease subsisted ten weeks during the cruize, and the ship was only cleared at last by getting to port. The small-pox were of the worst kind; for out of fifteen taken ill, four died on board, and three at the hospital, which is a large proportion.

The Captain after all brought into port forty-two men, who were unconscious of having had the disease. The Lords Commissioners of Admiralty were pleased to direct these men to be received at the Royal Hospital, if they wished to be inoculated; but it was left to their own choice, and only four out of the whole would submit to this practice. Mr. Farquhar observed that nitrous gas acted powerfully in correcting the smell of the sick berth, when the effluvia from the confluent small-pox, became very offensive.

Before we leave this subject, we beg, leave to repeat, that we have always found this contagion completely checked, provided the patient is removed before the third day of the eruption. We therefore

therefore suppose that the contagious matter has not acquired sufficient virulence at that period to communicate the disease.

In 1797 the *Crescent* frigate, on the Cape of Good Hope station, captured a Guineaman full of slaves. The contagion of small-pox, somehow or other, was received among them; nothing but inoculation could save the cargo. Mr. Anderson the surgeon, therefore, with great promptitude, inoculated the whole, all of whom, I believe, did well, and thus saved a valuable prize to his officers and shipmates. In such situations we would always recommend a similar practice.

While I am employed in compiling these remarks, at my return from sea in November, I find the attention of the medical world earnestly engaged in ascertaining the validity of new evidence on this disease; evidence pregnant with wonders, and opening a prospect of securing the human frame against one of its most alarming distempers!

A treatise by Dr. Jenner, on an epizootic disease, commonly known to dairy farmers by the name of the Cow-Pox. This treatise has been followed up by a work of Dr. George Pearson, intitled, "An Inquiry concerning the History of the Cow-Pox, principally with a view to supersede and extinguish the Small-Pox*." In consequence

* Johnson, St. Paul's Church-yard, London, 1798.

of queries sent to different parts of England, to physicians and surgeons, by the learned and indefatigable author, a mass of evidence is produced of the most satisfactory kind, and from which Dr. Pearson has drawn the following corollaries :

I. " Persons who have undergone the *specific fever* and *local disease*, occasioned by the cow-pox infection, communicated in the accidental way, (who had not undergone the small-pox,) are thereby rendered unsusceptible of the small-pox."

II. " Persons who have been affected with the *specific fever* and *peculiar local disease*, by *inoculation of the cow-pox infection*, who had not previously undergone the small-pox, are thereby rendered unsusceptible of the small-pox."

III. " The disease produced by inoculating with the matter of the cow-pox, does not differ from the disease produced by inoculation with the matter from the human animal; nor is any difference observed in the effects of the matter from the first human subject infected from the brute animal, or from the matter generated successively in the second, third, fourth, or fifth human creature, from its origin in the brute."

IV. " A person having been affected with the *specific fever*, and *local disease*, produced by the cow-pox poison, is liable to be again affected by the same poison as before; and yet such person is *not* susceptible of the small-pox."

V. " A person is susceptible of the cow-pox who has antecedenly been affected with the small-pox."

VI. " The

VI. "The cow-pox is not communicated in the state of effluvia or gas ; nor by adhering to the skin in an imperceptibly small quantity ; nor scarce, unless it be applied to divisions of the skin, by abrasions, punctures, wounds, &c."

VII. "The local affection in the cow-pox, produced in the casual way, is generally more severe, and of longer duration, than usually happens in the local affection in the inoculated small-pox ; but in the cow-pox the fever is in no case attended with symptoms which denote danger ; nor has it, in any instance, been known to prove mortal."

VIII. "No consequential disease, which should be attributed to the cow-pox, has been observed ; nor has any disease been excited, to which there previously existed a disposition ; nor has it been discovered to produce a predisposition to particular diseases."

IX. "The cow-pox infection may produce the peculiar local disease belonging to it, but without the disorder of the constitution ; in which case the constitution is liable to be infected by the small-pox infection."

Such are the conclusions drawn from the extensive inquiries of this great physician, and promise much benefit to mankind. The heart of every honest man must warm at the perusal of these pages, that unfold to society the diligent and active labours of the medical profession to lessen the evils incident to human nature. And should the whole answer the wishes of every lover of his species, we shall

shall hope to see some of the Gloucestershire cows transferred to the navy farm, that surrounds the walls of Haslar Hospital, for the purpose of inoculating the whole seamen at Spithead, and thus prevent any return of that infection into our ships of war, that we are now employed to defeat.

MEDICINA NAUTICA.

EPIDEMICAL OPHTHALMIA.

ACCOUNT of an EPIDEMICAL OPHTHALMIA, *that prevailed on board his Majesty's Ship SATURN.*

By Mr. JAMES REILLY, Surgeon.

“ S I R,

“ I N compliance with your request, I herewith send you the history of a species of Ophthalmia, that prevailed on board his Majesty's ship Saturn in her late cruize off Brest; during which we had not less than three hundred attacked with it in the month of October.

“ The symptoms were, pains in one or both eyes, with dimness of sight, and an uneasy sensation, as if sand or some extraneous substance had insinuated itself between the palpebra and eye-ball, the tunica abluginea highly inflamed, and the vessels thereof very turgid. In some cases, quickness of pulse and febrile symptoms accompanied; also severe headach.

“ In treating it at first, I gave cooling purges, indulged the use of the lancet, and had recourse

to astringent collyria; which practice I found to succeed.

“ After these I gave calomel, to the quantity of five grains at night, and an ounce of natron vitriolatum in the morning, which in every case except four effected a cure.

“ These four patients had, from the beginning of their indisposition, symptoms of typhus: such as great debility, dejection of spirits, disturbed sleep, nervous complaints, and much sickness at stomach, with low pulse. Although their eyes were very much inflamed and painful, and complained constantly that sand had got into them, I was under the necessity of varying the treatment. On the third day there appeared a great discharge of saliva, of a red colour, and seemed to come chiefly from the gums. Three of them, from a liberal use of wine and bark, with opium at bed-time to procure rest, recovered, after a long and painful confinement: the other died, with symptoms of great putrescency.

“ The cause of this general malady, I believe to have been some peculiar constitution of the atmosphere. At this time also the people had been mischievous enough to heave the hanging stoves overboard; and the moisture was never sufficiently dried up, prior to its making so rapid a progress. When the weather was damp, and the wind blew from the southward and eastward, I had more falling ill, than when the wind came from a different quarter: as the wind, therefore, shifted, our sick-list fluctuated accordingly.

“ We at this time scraped the between-decks, in preference to washing ; and took every possible pains to prevent the accumulation of humid air. I agree with that discerning officer, Sir Roger Curtis, that this is the predisposing cause of numerous evils in our ships, as expressed by him in those neatly-arranged remarks of his, published in your *MEDICINA NAUTICA*. I have the honour to be, with great respect, Sir,

“ Your most obedient and humble servant,
(Signed)

“ Nov. 30, 1797.

“ JAMES REILLY.”

“ To Dr. TROTTER.”

We have known several instances of Ophthalmia being epidemical in his Majesty's ships in the manner described by Mr. Reilly ; and it always occurred during a similar constitution of the atmosphere, a thick haze, something like what is observed to produce catarrh, and a cold easterly wind.

It has always been remarked, that an easterly wind peculiarly affects the inhabitants of Britain ; our universally prevailing influenzas have always been accompanied with an easterly breeze, and by it seemed to be imported from the Continent of Europe. By finding the eyes so easily affected by chemical stimuli, we might suppose that some of these impregnate the air, and excite those painful ophthalmias. But what these stimuli may be, it
must

must be difficult to find out ; and where they originate and are first diffused in the atmosphere, appears to set investigation at defiance.

In the spring of 1793, while the Vengeance lay at Spithead, a disease of this kind was general among the people : it first affected one eye, and afterwards the other, but seldom seized both at first. My own eyes being weak, and easily affected by the weather, I was one of the first sufferers. My cure was accomplished by keeping in the dark, for the pain was so acute that my eyes could not bear light, bathing the eyes in cold water, and abstinence. In severe cases, however, where the blood-vessels of the tunica conjunctiva are very turgid, I would recommend opening them, by puncture, as giving most speedy relief, almost instantly ; and next to this, blood to be taken away by cupping the temples. Blisters in the later stage are sometimes useful ; but we think the cerussa acetata and vitriolated zinc often do much harm, when applied before the inflammation declines.

MEDICINA NAUTICA.

NITROUS ACID IN SYPHILIS.

*On the Effect of NITROUS ACID in the Cure of
LUES VENEREA.*

THE attention of the medical world has lately been called to a new antisyphilitic remedy, in the nitrous or nitric acid, first tried and recommended by Mr. Scott, of Bombay, whose account of it was published by Dr. Beddoes, in the last part of his “*Considerations on the Medicinal Use of Facitious Airs*,” Johnson, London, 1797. A successful cure of an obstinate venereal disease, performed at Bristol by the nitric acid, also accompanied the narrative of Dr. Beddoes.

On receiving the earliest information I speedily communicated it to some of my medical friends; and three cases were cured by the acid in the spring of 1797, all of them soldiers in the West Kent regiment of Militia, then lying at Portsmouth, by Dr. Huggan, the surgeon to that regiment. These cases were just mentioned in a letter to Dr. Rollo soon after, when corresponding with
6 him

him on the subject of diabetes. And much about the same time Dr. Browne, surgeon to the Royal Sovereign, the flag-ship of Vice-Admiral Sir Alan Gardner, administered it to several syphilitic patients, which was the first trial in the Navy. I shall add a short detail of Dr. Browne's practice.

CASE I.

Tyson Wilson, seaman, aged about thirty, was the first patient on whom the acid was tried. He had contracted a venereal complaint about four years before at Liverpool, and had undergone a regular course of mercury, by which he was apparently cured. But from that time he had been frequently attacked with what was deemed rheumatism, and had been sent to Haslar Hospital for that complaint. Suspecting a lurking virus, I had frequently administered mercury so as to excite a slight ptyalism, and kept it up for some time. At the time he began the acid, he had been under a mercurial course with decoct. lign. &c. for three weeks, without any apparent advantage. The symptoms of lues on first using the nitrous acid were, large nodes on the tibia of each leg so exquisitely sensible, that the slightest touch made him cry out; a large glandular swelling under his chin, ulcerated, and discharging acrid fetid matter; nodes beginning on his arms; swellings on the joints of

his fingers; copper-coloured dry, crusty scabs over his head; constant fever; high-coloured urine; no appetite; nocturnal pains so severe, that two grains of opium seldom procured him an hour's rest; hectic sweats about his neck and breast, and great debility. It was my intention to have sent him again to Haslar, when you put Dr. Beddoes's first account of nitric acid being used in venereal complaints into my hands. I thought him a very proper subject, and immediately desisted the mercurial course. I procured some of the best acid I could find in Portsmouth, and began him with seventy drops in a quart of water, to be taken in the twenty-four hours. Having heard me conversing in the sick berth with the young gentlemen concerning this new medicine, he was strongly prepossessed in its favor, and like a true sailor, thought the more he could take the better, and the sooner he should be well. At the hour of visiting the sick, six o'clock in the evening, he had finished his bottle. I was rather displeased at his hurry; but as he felt no uneasiness at his stomach, comforted myself with the hope he had not taken too much. Next day I increased his dose twenty drops; which I did daily, till he took two hundred and twenty drops, which I found as much as his stomach could bear.

On inquiry how he was the morning after the use of the first bottle, he said he had been in heaven (his own phrase) all night; that he had six hours sound sleep, and felt much stouter. About
the

the sixth day, I think, to his great surprise and my satisfaction, he could allow me to handle his nodes freely, so much was their sensibility diminished. In short, the cure went on as favorably as could be wished; the abscess healed, the nodes gradually disappeared, and in twenty-eight days, the 14th of May, he returned to his duty, a stronger and healthier man than he had been for four years.

The only inconvenience he felt during the use of the acid was an *ardor urinæ*, for which he drank linseed-tea; complained he had too much appetite, and said that he had not *time enough* during the night for sleep. Since his discharge from the list he has enjoyed uninterrupted good health, notwithstanding our having been almost constantly at sea during the last six months.

CASE II.

Philip Austin, aged twenty-nine, one of the other patients, whom I informed you was taking the acid. He had also long laboured under the baneful effects of the venereal virus: sailors seldom complain too early to a surgeon; and it was owing to his receiving a hurt that I first discovered his complaint, for which he was put under a course of mercury, &c. I learned that he had been twice salivated for the same disease, (once in London,) and thought himself well. It is needless

to particularise the various changes of his complaint; suffice it to say, when he began to take the acid, his left testicle was diseased, very much enlarged, adhered to the posterior portion and lower part of the scrotum, ulcerated, and discharging a thin fetid matter, large hard dry scabs all over his legs, thighs, and elbow-joints, a slight paralytic affection of the left arm and eyelid, an incontinence of urine on catching the least cold, and great pains of his bones, particularly the head.

This man began to take the acid about the same time that Wilson did, with equal good effect. It is to be remarked, that after using the acid a week, the dry crusty scabs began to peel off, and some of the largest discharged a good conditioned pus, were treated as a simple purulent ulcer, and healed as kindly. The ulcer of the scrotum healed in four weeks; the testicle was somewhat reduced in size, and free from pain. He returned to duty on the 1st of June.

This man never could take more of the acid in twenty-four hours than one hundred and seventy drops. About three weeks after he returned to his duty, one of the largest sores on the upper part of his leg broke out afresh, for which he took eight bottles more of the acid drink. It soon healed, and he has ever since enjoyed good health.

CASE III.

John Evans, aged twenty-three, had venereal complaints of long standing, such as ulcers of the throat, copper-coloured scabs and eruptions all over him, but particularly on his breast, shoulders, neck, and face, with nocturnal pains, &c. He was put on a course of acid nitrous, and recovered perfect health, in which state he still continues.

(Signed) A. BROWNE, Surgeon.

Royal Sovereign, off Ushant,
October 21st, 1797:

In all the above cases it appears mercury had previously been exhibited, but with little success, and the symptoms had not yielded in the least till the acid was used. The immediate return of appetite, and refreshing sleep, are strongly exemplified in the first case. In the second we observe that a relapse was quickly checked and cured by the acid without mercury. The date of Dr. Browne's letter was near six months after the cures, and none of these men have complained since.

Some cases in the summer of 1797 came under my own prescription on board the hospital-ship, chiefly affected with cutaneous disædations, nodes of the shin bones, coryza, discharge of matter from
the

the nose, pains of the frontal bones, &c. Some of these men had taken mercury, but others denied having ever taken any. Yet they were all cured by nitric acid. The first effects of the medicine were, increase of appetite, profuse perspiration, and frequent desire of voiding urine.

I attended, last winter, a poor woman in Portsmouth, labouring under the disease of four years standing, and had been infected by a worthless husband. She was much reduced and emaciated, had nodes on the tibia of both legs, and also on the metacarpal bones of both hands, attended with excruciating pain night and day. She had, previous to these symptoms, venereal eruptions, buboes, and a multitude of complaints; had frequently taken mercury to make her mouth a little sore, but was never thought cured.

I ordered her the nitrous acid diluted, in such quantity as she could bear. In a week or ten days the nodes disappeared, and also the pains. But in another week they returned rather worse than before; the pains also equally severe: the medicine disagreed with her, and I was obliged to give it up. She obtained no relief till the warm weather set in, when she got strength; and she told me lately that she had received some benefit from what she was getting from her apothecary.

Some physicians and surgeons, I observe, continue to support the character of this medicine; for my own part, what success I have seen attend it, I am apt to think was very much owing to the
previous

previous exhibition of mercury. Yet there are certainly cases on record that speak strongly in its favor; and from what we have seen, we cannot but hope that it may still aid the use of mercury, and encourage us with the prospect of finding, at last, some cures for venereal affections more mild in operation than any of those we now employ.

Since my practice became more extensive among officers from my station in the navy, it is almost beyond belief the number of dyspeptic patients that have consulted me. Yet almost the whole are to be attributed to mercurial courses often unguardedly begun, and continued from obstinacy. It has been the fashion with some to give mercury to officers in every doubtful complaint, as being suspected venereal in its origin; and the stomach and intestines have been racked for months under this inconsiderate practice: palsy, and the most hideous train of what are usually called nervous affections, have been the consequence. Every medicine, therefore, that is introduced in the treatment of syphilis, by respectable authority, will deservedly meet the grateful thanks of mankind; and not be hastily abandoned, if it is likely to supercede the use of mercury.

I do not find now, among my medical acquaintance, many who are prepossessed in favor of the nitrous acid: what have been thought cures have generally broke out afresh, and of necessity

necessity the old remedy was resorted to. Some of Mr. Hammick's patients, whose cases were published by Dr. Beddoes, have again suffered a return of the disease: two or three of this kind have been reported to me in the fleet, and they were such, where a fresh infection could not be suspected. They all yielded to mercury, in the usual forms of prescription.

MEDICINA NAUTICA.

MISCELLANEOUS COMMUNICATIONS AND REMARKS.

Sparfa collegit.

WASHING HAMOCKS.

SEAMEN's hammocks are usually scrubbed with salt water ; but they ought to be plunged into a tub of fresh water afterwards, to take the salt out ; otherwise they will strongly attract moisture in damp weather, particularly on deck : this may produce catarrhs and rheumatism. A few tubs of water are sufficient for a ship's company. This practice is recommended by Captain Theo. Jones, of the *Defiance*.

I have often wondered why hammocks are made of such flimsy cloth ; surely a thicker canvas would be preferable, more cleanly, and durable in foreign stations.

Ung. Antipfor.

R Pulv. fal. armon. crud.

fal. nitri, ā ʒss.

Ol. succini, gt. x x.

Sulph. viv. ʒij.

Arung. porcin. ft. ung.

This formula is recommended by Mr. Carruthers, a very old navy surgeon, who never saw it fail, which was not always the case with other ointments of sulphur.

EXTRACTS *from a LETTER of Mr. JOS. FLEMING,*
dated St. Alban's, Halifax, July 24, 1798.

“ On the coast of Africa dysentery was the most
“ formidable disease I had to cope with, becoming
“ a sufferer myself, and reduced to extreme debi-
“ lity : my recovery was slow, and in sight of a
“ barren shore. After the necessary evacuations
“ with antimon. tartar, and Epsom salt, I thought
“ Dr. Moseley’s vitriolic solution a good tonic ; but
“ opium was the divine remedy. Your observ-
“ ation of strangury in this complaint I expe-
“ rienced.”

“ I have seen in the southern parts of America
“ obstinate intermittents cured by zinc. vitriol.
“ when large quantities of bark had been used to
“ no purpose ; and often witnessed the good effects
“ of opium given at the first approach of the cold
“ fit

“ fit of ague, as mentioned in your chapter on that
 “ disease.

“ I belonged to the *Nemesis* when the Ven-
 “ geance received the draught of men from her.—
 “ (*Vide MED. NAUT.* vol. i.) No wonder typhus
 “ was introduced into that frigate : for two months
 “ she was employed between Sheerness and Spit-
 “ head, carrying new-raised men, and sometimes a
 “ receiving-ship at the Nore ; there were seldom less
 “ than two hundred men on board besides her
 “ complement, most of them landmen very badly
 “ clothed. Capt. Ball was particularly attentive to
 “ their accommodation, in ordering the half-deck
 “ and fore-castle to be inclosed every evening with
 “ tarpaulins, and sails spread for sleeping upon ;
 “ which sails in the day were hung up between the
 “ masts, for the purpose of being aired in the day-
 “ time. Fires in hanging-stoves were also kept
 “ burning below, to dry the decks : fumigations
 “ with *devils* were also practised. No fever ap-
 “ peared in my time ; but in February she became
 “ so sickly, that her whole crew were sent to Haslar
 “ Hospital.”

R E M A R K.

The sickly state of the *Nemesis*, as just men-
 tioned by Mr. Fleming, was too much the case
 with other ships at the beginning of the war. The
 hurry and bustle which take place at the early stage
 of all armaments have produced similar disasters
 among new-levied men. While I was surgeon of
 the

the receiving-ship at Spithead in 1790, much evidence of this kind came under my observation; past misfortunes have not yet made us wiser. Yet we should think all occurrences of that sort might be easily prevented by having large spacious ships for the purpose, such as forty-fours and fifty-gun ships. But the landmen, who are commonly ill clothed and dirty, ought to be put into a kind of *recruits* uniform at once, and long clothes abolished, their hair cut short, and seamen might be appointed to initiate them into their habits, such as learning them to sling their hammocks, and lash them up, &c. This last fashion was always a part of Capt. Duckworth's discipline, and by it the raw landman found himself as if among friends, and was accustomed to the different forms of his duty, so as to think himself at home.

T. T.

Mr. Watherston, surgeon of the *Superb*, after being at sea in August, found the measles in the ship; and, agreeable to his instructions, used the nitrous gas: but so irritating was it to the patient, that the smallest quantity produced violent coughing, and he wisely left the infection to nature. The disease turned out to be mild, and extended to few, although there were fifty in the ship who never had measles.

Mr.

Mr. Watherston, in his letter of the 10th of February 1798, mentions the Egmont in the Downs receiving twenty-three seamen from the Bridgewater East-Indiaman, eighteen of whom labored under scurvy, and most of these in the very worst condition. He adds, “ The Bridgewater
 “ suffered very much from scurvy, between Trin-
 “ comale and the Cape of Good Hope, having,
 “ during a passage of thirteen weeks and three
 “ days, buried thirty-one men : some part of these
 “ were invalids from the ships of war in India.
 “ They were supplied with lemon-juice at the
 “ Cape, but from a tedious passage of thirteen
 “ weeks more from thence to England, during
 “ which time they encountered much bad wea-
 “ ther, scurvy again became general ; their stock
 “ of lemon-juice was soon expended, yet only one
 “ man died. Their chief dependence afterwards
 “ was bark and vinegar.”

R E M A R K.

We are not a little surpris'd at Mr. Watherston's information ; for we thought that the ships of the East-India Company, since Dr. Clark's time, had been supplied with every article in abundance to counteract scurvy, or cure it when it broke out. Thirty-one men buried from scurvy in a single East-Indiaman, during a passage to the Cape ! The account is horrible. This is an expenditure of British seamen not to be endured. Let it be known to that affluent Company, that

lemon-juice, prepared for the use of the navy, can be preserved in perfection for three years, and that the lives of these thirty-one men might have been saved for thirty-one shillings. I am at a loss to know under what medical jurisdiction these ships are fitted; but we blush to read such narratives at a time when the prevention and cure of scurvy are so well understood.

T. T.

Mr. Landlefs, surgeon of L'Unité, in his letter of the 25th of November, informs me that the ship lately put into a small port of Norway, where he found some people belonging to his Majesty's ship Hound, who had been sent on shore for a contagious fever. They were attended by a Dutch barber-surgeon, who was administering sugar and water, with refrigerants, and waiting with vast anxiety for a *crisis*! The English surgeon, not possessing the patient deliberation of the Dutchman's pathology, took his countrymen under his care, restored them with English fare, nourishment and good wine, and set them on their legs in two or three days, to the no small surprise of the inhabitants, but with what their former attendant thought would terminate their existence.

THEORY OF SCURVY,

By Mr. R. FAIRFOUL, Surgeon, *Cleopatra*.

Dr. Trotter, in his elegant Theory, built on the discoveries of the French chemists, has taught us the principle in recent vegetable matter that cures the sea-scurvy. It is certainly oxygene which effects the change; I only wish to extend his theory.

It is an old opinion that an alkali contained in the fluids is the cause of scurvy. The blood of people in health is known to contain ammoniacal carbonate, calcarious phosphate, and muriate of soda; and this last only in proportion to the quantity used for culinary purposes. Beside these, the blood must contain a naked alkali, from its property of changing vegetable blue colours to green, and this is either soda or ammoniac. In the blood of scorbutics this change also takes place; but it has not been determined whether the proportion of alkali is increased.

The fresh urine of people supposed to be in health changes vegetable blue colours to red: the urine of scorbutics has, in my experiments, changed them to green; and in sick berths, when the buckets have been allowed to remain too long uncleaned, the smell of ammoniac becomes intolerable. This decomposition also takes place in the urine of healthy people; but I fancy, by no means so quickly, nor to such extent. Ammo-

niac may be taken into the system from the use of putrid provisions: and the continued use of the fixed alkalis and lime is well known to bring on a disease very similar to scurvy; and they may produce this effect, by separating the ammoniac from the acids, and by that means forming other salts, as phosphate of soda, phosphate of lime, &c. some of which are found in the blood, and all in the urine.

Fresh vegetables, and acids, particularly those of the vegetable kingdom, are allowed by all to be the best means of curing the sea-scurvy. These are the substances which afford the principle necessary for the cure of that disease; but neither the citric, malic, or acetic acid, will ever be found to exist in the fluids. They are decomposed, either before they enter the system, or immediately after; and this is probably effected by the acidifiable principle of the acid entering into union with a substance prepared in, or separated by some organ of the body; and thus forming the phosphoric acid, which now unites with the ammoniac, renders it unhurtful to the system, and perhaps throws it off.

It is well known that the soft parts of the body, the fluids as well as the bones, contain a great quantity of phosphoric acid; and though this acid has been found in both vegetable and mineral kingdoms, yet it probably is originally the product of the animal kingdom. Phosphorus is a substance which is continually preparing in the animal body; and the atmosphere, assisted by recent vegetable matter,

matter, and by some medicines affords oxygene, or the principle necessary to convert it to an acid.

It is from these considerations that I would propose the phosphoric acid for the cure of scurvy; and think that, by giving an *animal acid* ready-formed, it will less require the powers of digestion and assimilation, which in scorbutics are much impaired; indeed, all the causes of scurvy probably act by diminishing these powers.

A French chemist has observed, that very little phosphoric acid is to be found in the blood of gouty people, and supposes that the acid is not thrown off by urine, but is conveyed to the joints, where it occasions the disease. I would differ from him in his conclusion, and am rather inclined to think that the powers which produce the phosphoric acid are so much debilitated that they cannot produce a sufficient quantity to counteract the bad effects of the calcareous earth, which we are continually taking in with our nourishment.

There are many objections to the above theory; but I think it sufficient to warrant a trial of the phosphoric acid.

S C U R V Y.

Dr. Browne, of the Royal Sovereign, while using the nitrous acid for curing the lues venerea, observed the symptoms of scurvy to supervene exactly as we have often seen them during a course

of mercury. They advanced so quickly, that he was under the necessity of administering lemon juice, till the scurvy disappeared; the cure of syphilis was afterwards completed by the nitrous acid.

In Dr. Rollo's work on Diabetes, we observe an account of a general scurvy appearing among the convicts on board the hulks at Woolwich, during the severe winter in April 1795. This was the time the Channel Fleet suffered so severely; and the causes producing it in both instances appear to have been very much alike. The convicts had no fresh vegetables from the 12th of October 1794, to the 24th of April 1795. The scurvy was first observed about the 13th of April; and was soon cured by recent vegetables, so as to be unknown in July. Their diet consisted of boiled barley or oatmeal porridge for breakfast and supper; broth of ox-cheeks and shins of beef, with a portion of the meat, for dinner; a proper allowance of bread, and three pints of small-beer daily. The preceding winter was uncommonly severe, with much frost, which destroyed all esculent vegetables.

D Y S E N T E R Y.

It would seem that this disease is very much connected with the state of the atmosphere, probably as affecting the condition of the surface of our bodies; and often appearing after sudden transitions from warm to cold weather. A squadron under the command of Rear-Admiral Man arrived in England about the end of December 1796, after a passage of eleven weeks from Gibraltar. The wind during this time was mostly to the Northward of East, and intensely cold. Previous to the passage the ships had been for many months employed in blocking up a French squadron under Admiral Richery in Cadiz. The insipid duty of a blockade, if I may use the expression, tends more than severe labour to exhaust both officers and men. The dull routine of service, the same objects constantly in view, with occasional signals to tack or wear, are all the variety that it affords; thus the spirits of a ship's company sink into listlessness and inactivity, and hence the predisposing cause to peculiar diseases. The Defence was the chief sufferer at this time, from a fever attended with singular symptoms, and a great mortality. But though numbers perished, a third of the ship's company were only saved by Captain Wells giving up all his private stock of choice and delicious wines, with other necessities, for their use. Some of these ships were much afflicted with scurvy and dysentery. The

Cumberland came to Spithead, having lost eleven men in the passage, and landed forty at Haslar, very debilitated, in dysentery, large ulcers, scurvy, &c. The surgeons of this Squadron remarked that their people suffered exceedingly in the Channel from their thin and worn-out clothing, most of the ships having been some time abroad. This, I believe, is a common observation in all ships coming from warm countries in the winter season; we wish some general regulation to be made on this head: warm and thick floss might be kept in the stores abroad, and issued to the ships when they are ordered home. It is not to be expected that seamen, thoughtless and improvident, will ever attend to this circumstance themselves.

TYPHUS.

In the memorable retreat of the Squadron under Vice-Admiral Cornwallis from the French fleet, on the 19th of June 1795, a seaman in one of the ships, convalescent from typhus, was in his weak state so overcome by fear, that he quickly relapsed. His fever afterwards was remarkable for violent nervous affections; and he died in a few days, dreadfully convulsed.

EXTRACTS *from a MS. intitled* "NAUTICAL
REMARKS,"

By Mr. ALEX. REID, Surgeon in the Royal
Navy.

As part of sea-diet he recommends the pease to be deprived of their husks by a mill, previous to boiling; and adduces some cases of violent cholic, caused by eating pea-soup as now used in ships. These affections are liable to happen with persons of weak and dyspeptic constitutions; and for these reasons numbers of men never taste the soup. He found zinc. vitriol. Zi given immediately, so as to excite vomiting, remove the disease. He adds, that he knew a young lady in Scotland, who had nearly perished by eating raw green peas, and drinking after them a glass of new ale. This lady was relieved by rolling her to and fro, which had the effect of removing the flatulency.

Mr. Reid approves much of my opinion of dancing, and providing a band of music in every ship: he hopes the arguments I have employed will be duly attended to by every one who regards the comfort and health of seamen.

He recommends a certain number of fishermen's boots to be supplied to each ship, to be worn by the people who wash decks in a cold morning. But he cautions every officer against washing decks in the winter months; they had better scrape the
nails

nails up. He has known many obstinate intermittents begin during this period of duty, and severe headachs, from the head and feet being long exposed to different degrees of heat. This practice is now unknown in well-ordered ships; and the diseases which it produced are, also on the decline.

He observes that great pains are often taken to pump out *foul air* from the holds of ships; but the same exertions are not made to throw *fresh air* in. Windsails, in bad weather, cannot be employed: he therefore recommends some machine to be constructed, like the common bellows, on a large scale, with long leathern tubes, to direct the air occasionally into any place below it may be wished to ventilate. Some plan of this kind would certainly be highly advantageous.

Mr. Reid was a pupil and inmate of the celebrated Dr. John Brown of Edinburgh. Every person in the house was in the habit of taking laudanum in great quantities. The servant-maid one night, in the dark, mistook a bottle of the laudanum for brandy or whisky, and drank a great deal of it. The alarm was immediately given to the students; she was found stupid, and black in the face. Mr. Reid opened a vein, and she recovered: he also gave her vol. spirits, &c.

Mr. Reid was assistant to the Naval Hospital at Villa Franca, in 1783. The hospital stood on a peninsula. There were a number of bad
ulcers

ulcers sent from the ships on shore; but notwithstanding the patients had abundance of fresh provisions and fruit, the ulcers were obstinate, and seldom healed. The inhabitants of the place said it was the same case with themselves; they attributed the difficulty of cure to the sea-air, for they always moved up the country for the cure of sores, and they found that to answer. Could any practical inference be drawn from this fact in the treatment of our malignant ulcer?

Since the establishment of a regular supply of vegetables in 1795 to the ships, on returning to port the necessity which at first produced it is in a measure done away. The seamen themselves have insensibly imitated the practice; and it is common now in most ships for the men to carry to sea, at their own expence, a quantity sufficient for a long cruize. Something similar to this occurred after the change of sick necessaries in 1794; and from that time tea, or herbs with sugar, have been hoarded up, equal to a four months' expenditure, in the different messes. The good effects which must follow a custom of this sort is not merely a preservation of health; it encourages industry and a care of their money; by which means they are diverted from the indulgence of spirituous liquors. We earnestly recommend all officers to countenance this practice,

tice, and to mention it to their people on receiving pay or prize-money.

A number of marines having suffered much from the cold in severe frosts, while standing as sentinels on the poop, gangway, and fore-castle, we would recommend the practice of changing the men every hour; even although double the usual number should be kept out of bed for the purpose.

Some of our correspondents still regret that soap has never yet been issued by authority, through the purfers. We think it would be a great piece of economy to supply seamen with that kind of soap for washing that *lathers* with salt water. The Portuguese make a soap of this kind on the coast of Africa; but it might be done in England: it depends on a larger portion of alkali, which adds a little to the price. This practice would save fresh water; and it must always be deemed a severe restriction when the people are not allowed water for washing: on many occasions it would be preferable to deny them drink, rather than prevent regular cleanliness.

MEDICINA NAUTICA.

D I E T.

Utile Dulci.

THIS branch of medicine is of the first importance, and we are glad to see it engage the attention of officers and surgeons 'more than in former times. The state of a sick person confined to bed in a sick berth on board a ship, can be better understood than expressed, and must naturally excite the sympathy of every one who has experienced sickness at sea. The surgeon's necessities afford tea, cocoa, rice, sugar, and ship's wine, which, with portable soup and barley, and flour lately ordered for bread, constitute the diet of a sick berth. These articles are all very well in their way, but they make but a small proportion of the good things of life, and are poor substitutes for an hospital fare, accommodated to the taste, desires, and appetites of patients weakened and reduced by disease. We firmly believe if one half of the money expended on chests of medicine were laid out in the comforts of diet, much real advantage

vantage would be gained. Medicines judiciously prescribed and duly administered, must contribute their full share in the recovery of health; but it ought to be remembered that they have but a share in the business, and their use is often lost, or at best doubtful, if a corresponding diet does not accompany them. I have seen so much done by a few delicacies from the tables of officers, that I shall never cease to recommend improvements in this department. The charity of these gentlemen is not in need of my eulogies, it will be registered elsewhere. When I see a lavish exhibition of medical articles, without a food grateful, nourishing, and cordial, in debilitated conditions, it reminds me of the scripture allusion, “ *I asked for bread,* “ *and you gave me a stone.*”

I shall, therefore, make no apologies for laying before my readers some extracts from a small work called the “*Seaman’s Guide,*” by the Honorable John Cochrane: in which philosophy has been commendably employed in giving directions how to live comfortably at sea. I am the more induced to do this, as it may tempt many to peruse the whole pamphlet. We begin with the staff of life,

“ B R E A D .

“ The process of making yeast, as practised at
“ Edinburgh, is as follows :

“ Take two ounces of hops; boil them for an
“ hour in two gallons of water; and, boiling
“ hot,

“ hot, scald eight or ten pounds of flour, and
 “ stir it very well into a paste. Do this about
 “ eleven in the forenoon. Let it stand till six
 “ o’clock in the evening; then add about a quart
 “ of yeast to forward the fermentation, and mix
 “ it well together. Next morning add about as
 “ much more flour and water sufficient to make
 “ it into dough; and in the afternoon it will be
 “ fit for setting sponge and baking. Reserve al-
 “ ways a piece of the old dough to mix with the
 “ new batch, instead of the yeast; which is ne-
 “ cessary only the first time, to hasten the process.
 “ The above quantity of hops will suffice for an
 “ hundred and twenty quartern loaves.

“ This process in Scotland requires about thirty
 “ hours; in a warm climate a few hours would suf-
 “ fice; as fermentation there advances with great
 “ rapidity. A due attention must be paid to that
 “ circumstance, as every thing depends upon it.”

“ How to use the dough.

“ Take a piece of dough and keep it for use.
 “ It will keep for several days very well. Mix the
 “ dough with some warm water, not very hot,
 “ and knead it up with some flour, to ferment
 “ and sponge. Divide the flour into four parts:
 “ mix a quarter of the flour with the leaven, and
 “ a sufficient quantity of water to make it into
 “ dough, and knead it well. Let this remain
 “ until it ferments and rises properly; then dilute
 “ it with more water, and add another quarter of

“ the flour, and let it remain to rise. Do the
 “ same with the other two quarters of the flour,
 “ one quarter after the other, taking particular
 “ care never to mix more flour until the last has
 “ risen properly. When finished, divide it into
 “ loaves; and let the loaves remain to rise, in
 “ order to overcome the pressure of the hand in
 “ forming them; then put them into the oven,
 “ and reserve a piece of dough for the next
 “ baking. Dough thus kept, might, with proper
 “ care, be prevented from going into the acetous
 “ fermentation, by mixing, from time to time,
 “ fresh flour. This practice is particularly re-
 “ commended to be followed by those persons
 “ who do not like any *acidity* in their bread, or
 “ have an equal dislike to the bitter arising from
 “ hops. On board a ship, this mode may be
 “ easily practised, as, from the regularity of keep-
 “ ing watch, the time for mixing the flour can be
 “ adhered to with great exactness. From an igno-
 “ rance in the art of baking with leaven, very few
 “ ships attempt even to bake rolls for the officers,
 “ and fewer still for the ship’s company.”

The above extracts are so plain, that nobody can
 misunderstand the directions given. The surgeon,
 therefore, by purchasing a quart of yeast when he
 goes first to sea, to begin the fermentation of the
 leaven, may order the process to be continued
 daily so as to afford rolls for any number of sick;
 and we earnestly recommend this practice.

The leaven here directed also possesses the qua-
 lity of raising the *flour pudding*, and making it light.
 and

and easy of digestion. Half the quantity of leaven ordered above will serve the whole puddings used at one meal for six hundred men, which is the complement of a seventy-four-gun ship.

“ B E E R.

“ To every quart of porter or strong ale, add
 “ two quarts of water, moderately warm. To
 “ every quart of this mixture, add a table-spoon-
 “ full of brown sugar, or a wine-glass-full of syrup
 “ or molasses. Put the whole into a tub; beat
 “ and whisk it with a bundle of rods for at least
 “ half an hour; bottle and cork it, and tie the
 “ corks down with strings. The pressure of the
 “ corks upon the strings will show the progress of
 “ fermentation, which will be slow or quick in
 “ proportion to the warmth of the weather. In
 “ the East or West Indies, fermentation is so quick,
 “ that what is made in the evening is ripe next
 “ day. When once made, always preserve a bot-
 “ tle or two of the old, and mix it with the new
 “ making, as it quickens the fermentation, and
 “ makes it more brisk and lively. The quantity
 “ made must be, in warm climates, in proportion
 “ to the daily consumption, as it speedily turns
 “ sour. If this small beer is wanted in large quan-
 “ tities, it may be made in casks, in the same man-
 “ ner as spruce beer: but do not draw it entirely
 “ off; always reserve a proportion of the old to
 “ mix with the new. The ale to be taken to sea
 “ for the purpose of making this beverage, ought

“ to be made very strong ; but by no means to be
 “ reduced to an extract, or such a substance by
 “ boiling, as will evaporate the vinous and active
 “ part of the malt liquor. Good strong ale, that
 “ will bear thrice its quantity of water, will be
 “ sufficient.”

We thus have, by the plan of the honorable author, a small beer that can be made in any climate, and its value to the sick in warm countries is beyond rubies. Officers, whose fortunes enable them to bestow comforts on the sick, would do well to provide some dozens of strong-bodied ale for that purpose, which can be manufactured under the eye of the surgeon when there is occasion for it. Mr. Cochrane also recommends the grog to be made into *punch* with brown sugar, which, when bottled and kept a little while, undergoes a slight fermentation, and becomes brisk and wonderfully grateful. Our surgeons, being now well provided with lemon-juice and sugar, can prepare *punch* in this manner without any expence ; as the purser would charge the spirit to the sick that use it.

“ M I N C E D C O L L O P S.

“ In short cruizes the following mode of pre-
 “ serving beef is recommended. Take beef, and
 “ chop and mince it very small ; to which add
 “ some salt and pepper. Put this in its raw state
 “ into small jars, and pour on the top of it some
 “ clarified butter. When intended for use, put
 “ the

“ the clarified butter into a frying-pan, and slice
“ some onions into the pan, and fry them. Add
“ a little water to it, and then put in the minced
“ meat: stew it well, and in a few minutes it will
“ be fit to serve up. This is a favorite dish in
“ Scotland. Few families are without it, as it
“ keeps well, and is always ready as an extra
“ dish.”

“ To render pea-soup or barley-broth pleasant
“ and palatable, fry onions in butter, and pour
“ into the soup.”

“ There is a practice now in use on board of
“ the American whalers, who are generally out
“ ten or twelve months in a voyage, that deserves
“ to be mentioned. They take cyder on board
“ in casks, into which they put a quantity of
“ sound apples. The apples are thus kept in
“ high preservation; and as they draw off the
“ cyder, the apples are given to the men, to be
“ either eat raw, or made into puddings.”

In our former volume we mentioned that apples had been distributed to a squadron of ships of the line, where the seamen were overrun with scurvy. The demand for lemons had, that year, been so great, that we employed the apples: but the method now mentioned by Mr. Cochrane for preserving them, must be highly useful in long

voyages: they are, besides, grateful as a change from lemon-juice. We cannot take leave of Mr. Cochrane without returning him our warmest thanks for what he has provided for the comforts of a sea life; and he may rest assured our authority will not be wanting to serve up his dishes to the inhabitants of the sick berth.

As it is my duty, from being at the head of the medical department of the fleet, to receive every hint for improvement in the treatment and comfort of the sick, and to direct the same to be used whenever it can be practised with advantage, I shall lay before my readers a letter from a female correspondent, whose good sense has well qualified her for what she writes upon.

MELROE'S SOUP.

“ S I R,

London, Jan. 29th, 1798.

“ I have hit upon a method of making cheap soups, and other dishes suitable to the necessity of the times. One or two of the soups will be proper, I flatter myself, in the navy and other departments; I have, therefore, taken the liberty to address you on the subject, and communicate the method of making the soup, wishing you will have the goodness to make a trial of it; first in the officers' messes, and then in the seamen's.

“ By

“ By the experiments which I have made on animal diet, I have found that fat is the essence of meat, or nearly so : my “ Cookery ” is founded on this, as will appear from the recipe :

Take beef suet, four ounces.

Scotch barley, lbs.

Oatmeal or flour, 3 or 4 ounces.

Onions, 3 or four ounces, or

Leekseed, a small quantity.

Celery-seed, a small quantity.

Salt and pepper, a sufficient quantity.

Water, a gallon.

“ The barley is to be boiled in the usual way, about an hour before the soup is removed from the fire ; add the oatmeal or flour previously mixed in a little cold water. The suet had better be melted before the fire, and added fifteen minutes, along with the onions, celery-seed, &c. in a bruised state, previously to the cookery being finished.

“ The value of the above will be found to be about 4 d. a gallon, sufficient for eight men : if a cake and a quarter of portable soup is added, the value will be 10 d. If you suppose my cookery to be unwholesome from the suet contained in it, then, by the same chain of reasoning, the seamen’s pudding must be unwholesome, when eight men eat double the quantity of it, viz. $\frac{1}{2}$ lb. to $3\frac{1}{2}$ of flour, if I mistake not.

“ The fat combined with mucilage, as in the barley-broth, forms a mixture easily digestible, and, I think, highly nutritious. But I am open to conviction ; if you can make it appear otherwise,

by any chemical or physical reason, I will be glad to be informed. The soup is pleasantly tasted; but being a new-fangled mess, objections may be made, and an unfounded prejudice held against it. But at sea I can venture to predict, when nothing but *salt junk* is the order of the day, and should the day be cold, a pint of this soup will be a grateful meal to a sea-faring man. I am, Sir,

“ Your most obedient servant,

(Signed)

“ ELIZA MELROE.

“ To Dr. TROTTER.”

I have had several messes of this soup made at my lodgings in Portsmouth; but I think it ought to have twice or thrice the quantity of fuel and vegetables, which renders it very palatable indeed. The principles here laid down are very just: we know, from the experiments of some ingenious physicians, that the fat of meat is by far the most nourishing part; and severe labour can be better sustained by living upon it than on the lean portion. The flour or oatmeal and barley serve to combine or make it miscible in the water, and thus reduce it to an animal jelly or mucilage, while the vegetables impart their qualities, and render it antiscorbutic. We think this mess to be a great improvement in sea-diet; had the hospital-ship remained in the fleet, it would have been introduced into our bill of fare, as infinitely preferable to the unpleasant gluey portable broth now in use [throughout the Navy; which is also very costly and not much nutritious.]

Since

Since receiving the above letter, I have perused a book of cookery by this lady, where the same idea is extended into a cheap and easy system for housekeeping. Such a book will be highly acceptable to myself, and all half-pay officers, when our country no longer may require our services: the sailor says, that "the King's guinea goes farther than any other master's;" but in those days we shall have only half the present number*.

W A T E R.

We cannot leave the dietetic part of our work, without adding some remarks on Water. We were employed the whole summer of 1792 in making experiments on the best method of preserving water pure and sweet in long voyages; and a summary of these is published in a little work called "Medical and Chemical Essays," printed by Jordan, Fleet-street, for Mr. Moubray of Portsmouth, to whom I presented the copy at the time his printing-office and materials were burnt down in December 1794.

We found, after trying every thing, that the best practical method was gently *charring* the calks in putting them together, both staves and heads, which rendered the surface unfit to decompose the water. But so little was this practice deemed per-

* "An Economical and New Method of Cookery; a Saving of 30 per Cent. in Housekeeping." By E. Melroe. London. Longman, Paternoster-row. 1798.

fect before by the Victualling Board, that Mr. Reeks, the cooper at Weevil, showed me an order from the Commissioners, expressly forbidding it; as they said it blackened the fluid. It moreover makes the casks last longer, by hardening them against worms in warm countries, and also less apt to shrink from the hoops. The whole process is defended on chemical principles in the above work, and no man has dared to say they are wrong.

I have repeated this subject, because we had much bad water in the fleet last summer: I now, in the name of the service, request some Captain will take the business up, and carry to sea a given number of casks filled with pure water, one half charred according to our plan, and the other half in the common way. Some trusty person must superintend the duty, that it may be fairly tried, for we know it must succeed.

B E E R.

We have always been advocates for some change here; but we have been disappointed hitherto. We have, however, overcome so many bad forms, that we must persevere still. Our plan is, that two quarts of beer should be served out at twice, that shall contain the same proportion of malt as four of the present, but more hops, to make it keep. Besides the baneful effects of grog to health, the seamen have a practice of hoarding it up, that they may have a jolly drinking, as they term it; and

and I am sorry to add, this has given birth to much of their outrageous proceedings: for the unguarded character has thus been decoyed, and made an associate in plots by the designing and unprincipled 'villain. This kind of beer is only intended for sea-use.

MEDICINA NAUTICA.

MALIGNANT ULCER.

IN the spring of 1797, I was informed by Mr. Caird, surgeon of the Queen Charlotte, that a number of their people were afflicted with ulcers of a most obstinate nature, and not yielding to the usual remedies either general or local. He was under the necessity of sending many of them on shore to the hospital, where a change of situation did not seem to operate much in their favour. In this state his sick list continued for some weeks; and as the weather became milder in temperature, he did not observe any disposition for the better in the condition of the sores, which now increased in number. Several men that had been bled for different inflammatory diseases, such as catarrhs, sore throats, &c. complained that the orifice in their arms did not heal kindly, but became painful, somewhat swelled, hard, of a livid red colour, and which excited strong suspicions, that the wound had been made by a foul lancet, that had been employed for other purposes, such as opening abscesses, that could communicate infection. This opinion, however, was soon given up; for other lancets,

lancets, known to be in perfect order, and used by different mates, did not prevent similar appearances in other patients. Mr. Caird had at one time so many as twelve of this description in his list; in one of whom the affected part swelled and inflamed rapidly, ulcerated, and spread, till it assumed so bad an appearance, that he was sent on board the Medusa hospital-ship, about the beginning of May, while the fleet lay at St. Helen's.

The patient was a strong, healthy young man, and a seaman stationed in the maintop. The wound that was originally made with the lancet was now an ulcer of the size of a crown-piece, covered with a sloughy matter, black and fetid: the edges of the sore were ragged, and for a considerable space round, hard, and livid; but a degree of shining redness extended much farther, with tumefaction both above and below the ulcerated part. The pain was excruciating, extending downwards to the ends of the fingers, and up to the shoulder and arm-pit. The lymphatics leading to the axilla could be distinctly felt, but the glands above were not enlarged. Violent rigours accompanied this condition of the sore, resembling the cold stage of an intermittent, alternated with heats and sweating, but not producing a solution of the fever: thirst, sickness, and vomiting, were also concomitants. The eyes and countenance were flushed, severe headaches, and not without slight delirium at times; the pulse, though frequent and full, was by no means hard. He was not bled, as
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the accident was caused by that operation ; but he took brisk purges of *calomel* and jalap, in order to bring him down. The applications to the arm were fomentations and emollient poultices. Such was the treatment of the ulcer during the time the fever and inflammation subsisted ; and poultices were continued till the sloughs separated, with which the febrile indisposition disappeared. After this the surface of the fore looked clear and florid. A considerable hæmorrhage took place from one of the veins being eroded, but was soon restrained by gentle compression below the ulcerated part, and did not return.

This ulcer sometimes yielded so little pus, that it was difficult to remove the dressings ; and whenever it seemed disposed to assume this condition, we made free with stimulating ingredients, either sprinkled over the surface or mixed in the ointment, the chief of which were hydrar. nitrat. or ærug. æris. The patient often complained of pain in the affected part ; and there was always a necessity for a large dose of tinct. opii. at bedtime. This pain, when violent, always forboded some change in the complexion of the fore, that indicated the application of the metallic salts. He also took bark at this time. After the fever subsided, it was surprising to observe the great debility that followed, and a degree of emaciation that could scarcely have been expected. But as the appetite returned the strength was quickly recruited, by a diet at once delicate and nourishing, and which afforded plenty of variety, so that the stomach was never palled with

a repetition of the same kind of food. In six weeks from the time he left the Queen Charlotte, the ulcer scarcely needed a pledget, when he was sent on shore to the Hospital with others. He was afterwards invalided, from the stiffness and contraction that remained at the elbow.

It is to be remarked that the Queen Charlotte had, previous to the appearance of this ulcer, been long in harbour, where the men were living on fresh beef every day with abundance of vegetables; and all the subjects of ulcer were in the prime of life.

The fleet went to sea about the middle of May, and in a very short space after, other cases of ulcer, with the same general character, appeared on board the Queen Charlotte, and were sent to the hospital-ship. Some of these began from slight scratches and bruises; but in violence of symptoms, and the great extent of surface which the sore occupied in a few days, were infinitely beyond that described above. In the beginning of May the weather was rather cold for the season, but towards the end of the month it was warm.

When I visited the fleet at St. Helen's, there were some bad cases of ulcer in the Royal Sovereign and Terrible, but nothing unusual was taken notice of in the appearance they put on; nor had they yet shown the least tendency to become malignant.

On the 10th of June the objects for hospitals in the different ships were, by signal, sent on board the Medusa to be carried to port, which increased
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our number to sixty-five, the greater part of whom were ulcers, and evidently of a peculiar kind. The Saturn also sent some bad cases.

While these men remained in the hospital-ship, the treatment varied little from what has been mentioned above: cold applications were sometimes substituted for the fomentations, while the inflammation lasted, and seemed to answer better. Much advantage was gained by frequently changing the dressings, as the discharge in the sloughing stage was profuse and very fetid. In all our hospital practice, we never beheld so many ulcers together, that had, in so short a space, extended over the whole limb, whether leg or arm, with a loss of muscular flesh great beyond example, and leaving the bone quite bare almost the whole length. Some of the Royal Sovereign's people were affected in the back and shoulder, where blisters had been applied that soon degenerated into this foul, fetid, and malignant state of ulceration. Even the scalp was not secure against this disposition of wounded parts.

After the fever subsided, and the first sloughs fell off, and the surface appeared tolerably healthy and florid, our hopes of the sore going no deeper were sometimes disappointed. Little florid granulations, resembling small strawberries, and not unlike the healthy process of nature in a well-conditioned sore, would frequently appear over the whole surface, or on particular parts, but scarcely poured out any matter. These would sometimes disappear before the next dressing, seemingly by absorption,

absorption, after which the tendon or bone beneath would be left entirely bare. The fore at this time had not the least factor. In those cases where a large portion of integuments and muscle had discoloured, the strength of the patient sunk inconceivably fast, and extreme emaciation in the course of a few days was the consequence. Our wine was of the best quality, and when desired, was allowed in due quantity: but we were also well stored with fine bottled cyder and London porter. These articles seemed to snatch some of them from the very verge of dissolution, and they were occasionally changed for punch made from the fresh lemon. We had, at the same time, abundance of oranges, and eggs cooked in various forms of pudding. These cases were landed at the hospital; some terminated fatally, and a few amputations took place, but other particulars I have not been able to learn.

Amidst this groupe of misery, the state of a man from the Saturn was singularly shocking. He justly blamed his own indiscretion, and thus described his disease: He had, while in port, contracted a virulent gonorrhœa; but no uncommon symptoms attended, till he returned on shore with leave for a few days. He drank to the quantity of a bottle of raw spirit in the space of a few hours; the effects of which were next morning apparent in the inflamed state of the urethra, and parts adjacent. The glans penis swelled rapidly, and a paraphymosis was formed that produced extreme pain: the urine flowed only in drops, and added

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to his torment. He had also an acute fever, and transient delirium from the pain. It was in vain that Mr. Seeds employed the full force of the antiphlogistic regimen, such as profuse bleeding, quick purges, fomentations, and plentiful dilution. The symptoms advanced by too hasty strides to be arrested by any resources of medical skill. The gland of the penis soon dropped off: but the misery of the patient did not stop there; the whole body of the penis passed quickly through the stages of excessive excitement and inflammation, to complete gangrene and mortification, and separated at its very crura. The whole length of the urethra to the bulb sloughed away, and also the scrotum, leaving the testes and spermatic vessels barely covered with cellular substance. He died.

Cases of this kind have been frequent in ships, from the inordinate stimulus of vinous spirit: but there was reason to believe, that in the present instance there was a disposition in the body to malignant ulceration, but certainly aggravated by the quantity of spirit taken into the stomach, which from its undiluted form, was more likely to induce instantaneous inflammation: the complexion of the parts also confirmed this supposition, and it is to be remembered that the patient came from a ship that had the malignant ulcer on board.

In blistered parts, which assumed the characteristic appearance of this prevailing malady, there were particular spots that, inflamed, became dark-coloured and sloughy, which spread in all directions, till the whole extent of the blister was ulcerated.

ulcerated. Numerous little vesicles appeared on the margin, to a considerable distance, with inflamed edges: these quickly broke, turning of a dark red colour, in some places united with the large fore, and gave the whole an indented appearance somewhat resembling peninsulas in a sea chart. The vesicles appeared to be lymphatics inflamed by the absorption of the cantharides, which instantly partook of the general disposition to gangrene. During the whole of this process, an acute and violent degree of fever raged, with unusual pain of the affected part, which continued till the inflammation on the margin of the ulcer subsided, and the sloughs fell away. This commonly happened in four or five days; but in some cases the inflamed portion turned black and mortified, with a fetid discharge, in less than forty-eight hours.

Contused spots, even where the cuticle was not broken, were not exempted from this general tendency to ulcer. But parts that had been scalded or burnt, above all other accidents, most quickly assumed the nature of this horrid sore; spread and inflamed more rapidly, and in the end put on the most formidable appearance: deeper and larger sloughs were the consequence, and symptomatic fever violent in proportion. This was a general remark in every ship.

Even in the early stage, and sometimes before the cuticle had burst, so as to expose the naked surface, buboes appeared in the groin and axilla, not to be touched without much pain, and always

attended with fever. These, however, seldom suppurated; but when they did, they constantly exhibited the complexion of the parent sore. In the *Terrible*, the glands of the groin were more liable to be affected than was observed in the other ships: and in the *Triumph* only I have heard of them suppurating.

Although for the most part these ulcers sprung from some external injury, yet we have met with a number of cases, where neither wound, puncture, scab, or contusion, could be said to have first taken place. A small circumscribed red spot would be first perceived, scarcely to be felt; but in a few hours rising to a pimple, becoming black in the centre, and inflamed round the edges, till it increased in size, swelled and assumed every characteristic symptom, with concomitant fever and subsequent ulceration, sloughs and fetid discharge.

In the *Medusa's* hospital, at the several times the sick of the fleet were carried to port, were some cases of the common ulcer, sent from ships that had never been infested with the present disease. No particular attention was paid to keep these men at a distance from the others: some lay in the cradles next to the worst of the *Queen Charlotte's* people; yet we observed no disposition in them to put on the malignant form, but continued, while under our treatment, to do well.

To correct the bad smell of the matter we had recourse to none of the usual agents. The lamps for diffusing the acetous vapor were constantly kept trimmed: but our attention was chiefly directed

rected to the speedy removal of the dressings, and by that means we seldom found the effluvium so offensive as not to be approached with ease. While the men with ulcers remained in the *Medusa*, the duty of the surgeons and mates kept them constantly by the bedside of the patient.

The future cruizes of this campaign by no means exhibited so many bad cases as the first; more or less of the general disposition to ulcer remained in the *Queen Charlotte*, *Royal Sovereign*, *Terrible*, and *Saturn*, but were more successfully treated. The other ships of the fleet continued perfectly free from this sore.

During the campaign of 1798, we have had fresh horrors to encounter. The *Terrible* had never been completely free, but the *Royal Sovereign*, *Glory*, and *Triumph*, have been great sufferers indeed. The description and progress differ little from the preceding account; but from the multitude of severe cases that have occurred, the surgeons of these ships have had more laborious duty to perform, than has ever been known in the Channel since our attendance. Of all diseases that are liable to accumulate in a ship, one of the most improper must be such an ulcer as we are describing. Dangerous in its disposition and issue, generating a matter fetid beyond compare, the very atmosphere near the patient possesses a degree of pestilence that cannot be sufficiently corrected in a common sick berth. But if, as is generally asserted, this ulcer is of a contagious nature, the first thing to be done for the relief of the unfortu-

nate sufferer ought to be immediate removal from the ship ; and this also is the only certain security for the healthy part of the crew. But in situations of this kind at sea, how is the strength of a patient to be sustained without food suited to the weak condition of his stomach, and the nature of his affliction? The second stage of this ulcer is marked by emaciation and the utmost debility, and a discharge of matter from an ulcerated surface, sometimes most profuse and exhausting. If the former service of the fleet so strongly proved the utility of an hospital-ship, the want of one was now equally remarked. The timely removal in the preceding summer soon lessened the number of patients in these ulcers, while at the same time the diet was such as to afford them every delicacy and comfort ; besides all the advantages to be derived from lodging, cleanliness, and nursing.

The following extract of a letter from Dr. Browne, of the Royal Sovereign, dated at sea, the 18th of August 1798, will give some idea of the situation of his sick berth, from this pestilential fore :

“ Since I had last the pleasure of seeing you,
 “ we have been miserably harassed by those ulcers
 “ of the very worst kind ; and the rapidity with
 “ which the slightest injury to the skin degenerated
 “ into ulcer, and the havoc it made on the sur-
 “ rounding parts, in a few days, often hours, were
 “ far beyond any thing I had ever met with, in
 “ either East or West India stations. I have at
 “ present thirty-seven in my list, in this horrid
 “ ulcer ;

“ ulcer; and some of these, of very large size
“ indeed. When the ship was paid we had but
“ few in this complaint on board; and these were
“ in a healing way, and promised so fair that I did
“ not think them objects for an hospital. Two
“ days after we sailed from Cawsand Bay, I was
“ alarmed to find many of my fores nearly cicatrized,
“ displaying on the inner edge of the cicatrix a
“ watery bladder, with a dark-brown or black
“ spot in the middle. This was the focus
“ whence the flame spread; and, in the space of
“ three, four, or five days, destroyed not only the
“ labour of many weeks, but enlarged wounds to
“ three times their original dimensions; eroding
“ integuments, muscles, tendons, membranes, and
“ even the bones themselves. Wounds on the
“ body, head, &c. were equally affected with the
“ extremities. In short, I never met with any
“ thing like it in the course of my practice. The
“ patients had violent fever, ushered in by un-
“ common rigors and tremor; with such into-
“ lerable pain in the affected part, that opium
“ seemed to have lost all its powers of giving
“ relief. Some of them had a severe singultus,
“ during the sphacelation, and others, violent
“ vomiting; in either æther and opium afforded
“ little mitigation of the symptoms: bark and
“ wine had no apparent effect. The powder of
“ ipecac. administered in three and four grain doses,
“ once and sometimes twice a day, gave more
“ relief in the febrile state than any medicine
“ I tried. This was our situation nearly a fort-
N 3 “ night,

“ night, and seemed quite the rage of a pestilence.

“ I have now got my sores reduced to a more
“ promising state ; but the devastations occasioned
“ in that short period will be the cause of several
“ men losing their limbs. I have only ventured
“ on one operation, a small one, a part of the
“ hand : it promises well, this being the third
“ day ; for nothing could tempt me to such a
“ step during the rage of the contagion. Chang-
“ ing the sick berth did good ; and I made ample
“ use of Dr. Smyth’s nitrous gas. How far it
“ tended to check the contagion I am not at pre-
“ sent disposed to say : I assure you I never met
“ with any thing equal to it for checking and
“ ameliorating, nay totally destroying, bad smells.
“ Our sores, while sphacelating and sloughing off,
“ were attended with such an intolerable stench,
“ that the dressers and attendants were often
“ obliged to leave off for a few minutes. But on
“ the gas being applied around the limb for a
“ minute or two, it became perfectly sweet ; so
“ that you might stand over the sore, without
“ having your nose offended.

“ My sick berth is extremely well ventilated ;
“ but if ever I discover an uncomfortable smell,
“ which it sometimes has, from its vicinity to the
“ head in particular situations of the ship respecting
“ the wind, I then employ gas, and find it answer
“ my wish.” (Would not a little tobacco in the
nose do as well ? T. T.)

“ I ought to have mentioned that drunkenness
“ was not so prevalent in our ship at last payment,
“ as usual; and that the contagion (allow the
“ phrase, for I cannot impute it entirely to bad
“ habit of body) broke out in three very sober
“ men, who had been in my list for several weeks,
“ consequently were always under my eye: indeed
“ I did not find that the professed drunkards
“ fared worse than their more sober shipmates.

“ I am happy to say I find Mr. Baynton’s
“ plan equally as successful as ever in *old ulcers* :
“ in recent ones it does not answer my intentions ;
“ but the fault may be mine, and not that of this
“ improved treatment.” Mr. Baynton only re-
commends it in old ulcers.

This affecting narrative of Dr. Browne concludes with his regret that there was no hospital-ship where these pitiable objects might be moved in the early stage of the ulcer, whether for security against infection, or to give the men a better chance of recovery by advantages which they could not have in a common sick berth.

In the *Glory* it did not appear, from Mr. Carter’s observations, that his cases ever acquired the formidable aspect of those in the *Royal Sovereign* ; but the same general disposition of the ulcer was apparent. He particularly remarked that scalds and burns, above all others, soon assumed the malignant complexion, painful inflammation with ardent fever, and followed by fetid matter, and very large sloughs of the skin and muscular parts.

It appears from the following communication by Mr. Thomas Moffat, of the *Triumph*, that the ship's company have also suffered in a severe degree from this pestilential fore. The *Triumph* joined the fleet of Lord Viscount Duncan a short time before the victory over the Batavian fleet, but returned to Portsmouth, and accompanied the Channel Squadron last summer.

“SIR,

Triumph at Sea, 9th July 1798.

“Agreeable to your request, made in the circular letter of April last, and urged by daily proofs of its havock, I have directed my attention, in a particular manner, to the investigation of the nature and causes of that species of ulcer which has lately been so destructive in ships: and on such an important subject it pains me much that I have so little satisfactory to offer.

“My first knowledge of its existence was from a man superficially wounded on the leg in the late action in the North Sea, being sent to Haslar Hospital in October last, where it run through the course hereafter described, and spread so much as to render amputation necessary: the stump soon after was attacked in the same way, and in a short time caused his death. About the same time it made its appearance on beard, but without being much attended to till March last, when every scratch, even the puncture of a lancet in bleeding, became a formidable ulcer, occasioning, in a great variety of
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of instances, buboes in the groin and arm-pit, which generally suppurated; the skin, after the application of a blister, healed with much difficulty, and rarely without spreading and inflaming considerably. Scalds, more than any other species of injury, were observed to terminate in this manner.

“ For some days after the wound or other injury was inflicted, every thing went on well; when suddenly a violent fever came on, generally towards evening, and continued without any intermission for two or three days, sometimes a week; the sore meanwhile becoming inflamed and livid for a considerable distance around, throwing off very deep and fetid sloughs, of a grumous appearance, till the sore was twice or thrice its former size, with a ragged surface, as if gnawed by a dog, and high reflected edges. As it ceases to cast off sloughs, the fever subsides, and frequently both are over in two nights. After a length of time, more or less in different cases, when the sore had been brought to a healing state, it has frequently run the same course over again for several times successively.

“ I have no doubt of its being contagious: last summer it existed in the Channel fleet; while in the North Sea it was unknown; and as soon as we came round to Spithead it made its appearance on board. Several cases of ulcer and scalded feet, that have been kept entirely separate from the ship's company, have healed kindly, while others in exactly similar situations have required three or four months to heal. I have lately confined to the sick berth every bad case, and dressed them there; since
which

which fewer sores have been infected, and these appear to have lost a great deal of their original malignity.

“ From the appearances above mentioned, recourse was naturally had at first to bark, wine, and opium, which in almost every instance did harm, by increasing the fever and inflammation; in none any good. Poultices never failed, if applied but for forty-eight hours, to occasion hæmorrhage. Blood-letting on the first accession of fever, with a strict antiphlogistic regimen and constant confinement to bed, were then adopted, and with much more success than the former.

“ As soon as I met with Mr. David Paterfon’s letter to the Commissioners of Sick and Wounded, respecting a successful treatment of a similar kind of ulcer by nitrous fumigation at Forton Hospital, I had immediate recourse to the same plan, which I entered upon with the most sanguine hopes of like success. At that time there were twenty-five ulcers on the list, in all the different stages, a few of which I dressed with simple ointment, that I might judge more correctly of the effects of the fumigation on the others. The first five or six days it seemed to be of service, by correcting the putrid discharge of those in a sloughing state, and those that were previously clean began to cicatrize: in all it sensibly diminished the quantity discharged, and rendered it thicker. I was for these reasons induced to speak favorably of its effects in my weekly return to the Sick and Hurt Board; which, after a farther trial, I was obliged to retract almost

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in toto, much to my sorrow and disappointment. In that of the 1st instant I wrote as follows: " In my return of the 24th ult. I stated some good effects to have followed the nitrous fumigation in cases of bad ulcer, and from a farther continuation I had sanguine hopes of eradicating that malignity which has so peculiarly of late attended every ulcer. But in the course of last week several have relapsed, and run the same course over again of inflammation, sloughing, &c. as at first, whilst in others it has produced such excessive, uninterrupted pain, as to oblige me to desist from its farther use. Most of the others remain stationary. In such as can bear it, I shall continue to give a fair, impartial trial to the fumigating plan."

" Those cases where it produced such excessive pain felt speedy relief on omitting it. I began its use on a scalded foot before any bad symptoms appeared, hoping thereby to obviate the operation of the infection; but it notwithstanding ran exactly the same course as others. Those cases I mentioned before to have dressed with simple ointment are just as far advanced as if they had been fumigated; indeed more so than those where it occasioned so much pain.

" I have now continued it three weeks in the most sedulous manner twice every day; and the only good effect I can with any confidence vouch for the truth of is its sweetening the air in the sick berth, which had begun to smell offensive, from so many large putrid ulcers being confined there. No other ill effects were observed to follow its use,
but

but occasional coughing, and that only at first, or when the head was held immediately over the pipkin : and one man vomited whenever it came near him, unless near an open port to inhale fresh air.

“ I have again returned to the antiphlogistic plan with increasing confidence, being convinced more and more daily of the whole mischief lying in excessive excitement from the stimulus of contagion, which can only be brought down by blood-letting and other evacuations, by cold applications to the part itself, strict confinement to a recumbent posture, cooling regimen, and the mildest dressings.

“ By separating every man who appears infected from the others, I entertain hopes of extirpating it entirely from the ship, or at least of circumscribing its ravages.

“ Since we left Spithead, a number of very obstinate cases of acute rheumatism has occurred, which have required almost daily evacuations, either by the lancet, by purging, or by the skin.

“ In scurvy I have recourse to the lemon-juice with its wonted success. In one case the symptoms resembled rheumatism so much, as to render it very difficult to make the distinction. A few doses of the acid soon removed all doubt. I am much inclined to think that similar cases occur more frequently than we are aware of*.

* *Vide* the former works of the author.

“ It may, perhaps, be worthy of remark, that a man (my own servant) caught the small-pox when in Torbay last, and the eruption had taken place three days before it was discovered, owing to his having been confined to bed with rheumatism, in the cockpit, for some time before, yet no farther infection took place. The admiral sent him to Plymouth in a cutter the day we left Torbay. I am, Sir, your very humble servant,

“ THOMAS MOFFAT.”

“ To Dr. TROTTER.”

In a subsequent communication of Mr. Moffat I observe the following remark on the nitrous gas. “ I forgot to observe,” he says, “ in my letter, “ that the use of nitrous gas, as a destroyer of “ contagion and pestilential air, is not a very new “ discovery. Dr. Johnston of Worcester, eight “ or nine years ago, recommended it very strongly “ to Captain Effington, and shewed him the pro- “ cess in his chimney-corner. Captain Effington “ is now in the Triumph, and I give it on his “ authority.”

In the month of October, and when the weather began to grow cold, Mr. Moffat first observed a change for the better in the condition of his patients. Fewer cases of malignancy occurred; and wounds and accidents were disposed to heal more readily, without assuming the appearance of the epidemic ulcer. He was, however, under the necessity of sending fifteen to the hospital-ship in
Cork

Cork harbour, during a cruize off Ireland in quest of the French squadron which was so completely beaten by Sir John Warren's ships afterwards.

In August a case, on board the *Atlas*, in a marine, was mentioned to me by Mr. Brodie, as partaking of the nature of this ulcer, but was sent away immediately, from its suspicious appearance.

The following case, transmittted by Mr. John Crawford, seems also to have been nearly allied to our malignant ulcer. But it is valuable from the successful issue, and the ingenious mode of treatment.

“ His Majesty's ship *Success*, off
Havre, Nov. 14th, 1798.

“ S I R,

“ The same motive that prompted me before to write you, still actuates me to communicate every uncommon observation that comes within my ability. I can only regret my situation affords me so few opportunities of contributing my mite to so laudable a work. The hint of sending you the subjoined case of ulcer I took from your own circular letter. I have never read Dr. Rollo's work there alluded to.

“ *October 15th, 1798.* Samuel Seedsman, aged twenty-three years, of a lax fibre, yet general good health, had the inner and fore part of his left foot scalded by a small quantity of boiling water, which produced two vesications, each about the size of a shilling. He was taken into the list,
the

the blisters cut, and dressed with a pledget of cerate: this was repeated until the morning of the fifth day after the accident, when I observed they had a dark purplish appearance, and that on the lint there was little or no discharge. He now complained they were very painful, and that he had no sleep for the two last nights. This day inserted the case in my journal: dressed with cerate, and applied over catap. com. calid.

Hauft. anod. fum. hora fom.

“ 20th. Found little alteration; the same dark erysipelatous appearance continues: the lint a little discoloured with a brownish discharge: said he did not sleep well, but had not so much pain as on the preceding night.

Catap. emoll. et hauf. anod.

“ 21st. The surface of the fores, which before was smooth, is now somewhat sunk and unequal: a small quantity of brownish fluid on the lint. They are still painful.

R P. cort. Per. \bar{z} i. vin. adust. \bar{z} i. misce
et adde aq. commun. lbis fumend.
toto in die: catap. ut ante.

“ 22d. They have nearly the same appearance; are more enlarged.

Mixt. cort. Per. et catap. vice hauf. anod. u. a.

“ 23d. The fores are considerably deeper, and a greater discharge of the brown-coloured fluid; the edges are hard and red, and are in appearance
like

like a small earth-worm round the fore: the integuments for an inch round are much inflamed.

Mixt. cort. Per. &c. ut heri.

“ 24th. They have on their surface small pupillæ, which bled on removing the dressings: they have still the same dark erysipelatous cast, the edges ragged, the discharge brown and excoriating:—omitted the poultice, and sprinkled one fore over with the

Cort. Per. mixt. cort. Peruv. ut ante.

“ 25th. The edges still more jagged and uneven, the surface of the fore covered with small millet-like granulations, which bleed on the slightest touch; still a thin brown-streaked discharge.

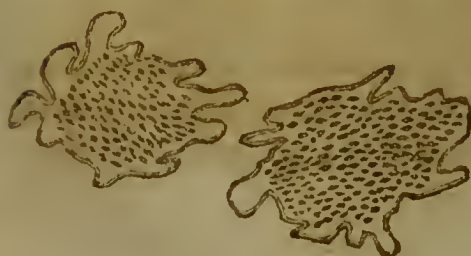
Mixt. cort. Per. Sprinkled the bark over both the fores.

I did not yesterday over both, that I might see the colour of the discharge.

“ 26th. The surface of the fores unequal and excavated, the edges ragged and notched in a manner I never saw before, and which I cannot describe better than by sketching the figures with my pen: they have a most disagreeable smell.

Mixt. cort. Per.

Sprinkled them over with
Hydrag. nit. rub.



“ This

This is as near the resemblance of them at this period as I can give the idea.

“ 27th. The dark erysipelatous colour still remains; the surface is more irregular; the narrow fores on the edges nearly communicate with each other: there was a greater discharge incited by the precipate, but it was nearly of the same colour: I again sprinkled them with the bark.

R Mixt. cort. Per. additione succ. limon.
 ℥ vi.

“ 28th. A greater discharge on the lint; the small fores on the edges enlarging, and seem becoming independent of the large ones, which have greatly increased since yesterday.

Mixt. cort. Per. &c.

App. cort. Per. ad ulcera ut olim.

“ 29th. Several of the small fores round the edges are independent of their parent; the interstice between them filled with a hard brownish substance: they are not larger since yesterday.

Mixt. cort. Per. &c. ut heri.

“ 30th. On washing off the bark, discovered that they had not their usual erysipelatous appearance, that their surface was more smooth, and they had not their usual bad smell. I fancy the sprinkling them with bark has not only corrected

this, but prevented their enlarging by absorbing the excoriating discharge.

Mixt. cort. Per. u. a. omitted sprinkling one fore with bark to see the discharge.

“ 31st. The discharge thin and whitish, or rather ash-coloured; their disposition towards enlarging seems to be stopped; there is no appearance of granulations; their edges feel horny to the touch. They are now at least three times as large as they were on the 25th.

Mixt. cort. Per. & app. hydrarg. nitrat.
Sprinkled the bark as before.

“ November 1st. Still no appearance of granulations: they are not near so painful.

Mixt. cort. Per. &c.

“ 2d. They are evidently disposed to heal, and are somewhat filled up since yesterday. There is a degree of redness round their edges, which I judge caused by the caustic. Omitted the sprinkling them with bark.

Mixt. cort. Per. u. a.

“ 3d. The discharge a glairy pale-coloured pus, mixed with small brownish particles; the sores are healing fast, but not with healthy granulations: the edges not so red.

Mixt. cort. Per. u. a.

“ 4th.

" 4th. The discharge is thicker, and they are incarning fast without granulations.

" 5th. Several of the small fores equal with the surface; the large ones are nearly so, and continue contracting.

Mixt. cort. Per. &c.

" 6th. The small fores healed, and the large ones closing rapidly.

" 7th. They continue contracting: omitted the bark mixture.

" 10th. He returned to duty.

" I have only to observe, that although at first they had some appearance of being scorbutic, yet no cause of suspicion for their being so existed. We had been, previous to their appearance, near three months at Spithead, during which time the ship's company had plenty of fruit, vegetables, fine weather, and no hard work; nor was there any tendency to that disease on our arrival from sea.

" When I first began the remarks, I had no idea of sending them to you, or I would have been at more pains in arranging them. They are, as you see them, simply copied from my journal. I am, with the greatest respect, Sir, your most obedient humble servant,

" JOHN CRAWFORD."

" To Dr. TROTTER."

Such is the brief history of this virulent sore, as it has afflicted the seamen in the ships in the Channel. It has also been common among others in Lord Duncan's fleet, particularly the Ganges; but we have obtained no information from that quarter.

The striking peculiarities of this ulcer are,

1st. Its rapid progress, by which, in the space of a few days, it passes through the various stages of inflammation, gangrene, and sphacelus, when the injured parts slough away, which puts an end to an acute concomitant fever.

2dly. It has been observed to prevail more in ships in port than at sea, or very shortly after leaving the harbour.

3dly. It has never assumed the complexion of a scorbutic ulcer, which is distinguished by the dark-coloured fungous mass laying over its surface, that on being removed, is quickly regenerated, and is commonly attended with some symptoms of scurvy, such as soft swellings of the legs, spongy gums, and fallow looks; on the contrary, in this ulcer, when the putrid parts separate, the surface is of a light florid colour. The scorbutic sore is seldom painful; our ulcer is attended at times with exquisite torment.

4thly. It has not been relieved by large quantities of lemon-juice, even to a bottle *per diem*: nay, we have thought that in some cases, much harm was done by this practice in the first stage.

5thly. We have not been able to distinguish particular constitutions more liable to be affected with

with it than others, except the strong and robust; nor have seamen been more exempt from it than landmen.

6thly. It has occurred in ships where every attention is paid to exact discipline, cleanliness, ventilation, and every circumstance connected with preserving health. It has also been treated by some of the most experienced and able surgeons in the navy: and there is nothing peculiar to the soil surrounding the ports of the Channel where it has appeared.

We cannot assert that it is a new disease; but we meet with nothing, in authors on Surgery, that is satisfactory in either the history of the symptoms or method of cure. Bell and Home, in their respective works, present us with nothing that answers our description; yet the experience of the latter in different climates, and in army hospitals, afforded very favourable opportunities. The surgeons of naval hospitals may have paid less attention to it, from the stage of fever and inflammation being generally on the decline, or finished before the patient comes under their care. About the beginning of the war, I think early in 1794, an unusual number of men were sent to the hospital at Haslar, from the *Hector*, with large ulcers. Some of them that I saw very much resembled the disease in question, after the sphacelations fell off, and left the surface clean. These men, from their immense number, belonging to one ship, were, not without much reason, suspected of having tampered with their sores, by escharotic applications, &c.

and this was confirmed by one of them confessing to the nurse, a little before his death, that he had bound a halfpenny over the part, in order to enlarge the dimensions, and give the ulcer a foul appearance. No other man, however, could be brought to this confession ; and it is probable that their affliction arose from very different causes. In the present instance we have no suspicion of the kind ; and we can safely rescue our patients from so foul an imputation. Men of the most approved conduct in their ships, whose characters were completely known, and whose veracity could not be impeached, and who could have no view in that mode of torture, have been sufferers in this complaint.

The writers on West-India diseases mention obstinate kinds of ulcer, which they have met with in these islands, and which were seldom treated with success, unless on going to colder climates. But their description does not answer to the early history of our sore, such as the degree of fever, excessive inflammation, and consequent sphacelus. Ulcers very difficult of cure appeared at Corsica, while possessed by the British forces : we have also heard that uncommon numbers in this complaint have been sent to the naval hospital at the Cape of Good Hope. Such accounts, however, as have been reported to us do not correspond with the Channel ulcer. Cleghorn, in his " Diseases of Minorca," speaks of bad ulcers in that island ; but nothing further is detailed for our information.

Dr.

Dr. Rollo, surgeon-general to the Royal Artillery, in the first edition of his justly-valued work on "Diabetes," has added, "A short Account of a Morbid Poison acting on Sores, and of the Method of destroying it." P. 253. (London, Dilly. 1797.) This account is so interesting in the present discussion, and so nearly resembles the description which we have given, that we shall transcribe the whole that applies to our purpose.

"After the formation of the Brigade of Royal Horse Artillery, many accidents occurred, especially in kicks in the legs of the men by the horses feet; and being generally on the shin, very unpleasant sores were produced. The wound was sometimes small and punctured, having arisen from the turned-up part of the horse's shoe, as formerly practised. The bone was often laid bare. We seldom had less than forty cases of sores at that time in the hospital.

"When this sore engaged our particular attention, and, from the rapidity of its progress and effects, very watchful examination was bestowed, it was found that a sore of any extent (some were very considerable, as 3 or 4 by 5 or 6 inches, and others small), in the promising state of healthy cicatrization, was liable to have a solitary ulceration on its edge, of unequal dimensions, the size varying, being smaller or larger than a pea. This distinct little ulcer was of a darkish colour, its edges jagged, its bottom unequal and ragged, and discharged a thin matter, having a peculiar smell. Such was the earliest
O 4 "state

“ state in which it was perceived ; but probably it
“ might have been distinguishable sooner. The
“ disappearance of the sore in the hospital deprived
“ us of a more minute and early inquiry.

“ The day after the little ulcer had been disco-
“ vered, it had acquired the size of a sixpence or
“ a shilling, extending itself every way, even on the
“ shin as well as on the surface of the former sore :
“ the discharge was now changed, having become
“ thickish, of a whitish colour, intermixed with
“ dark shades, and adhering strongly to the surface
“ of the part ; the peculiarity of the smell conti-
“ nued, and was become more offensive.

“ In another day the ulcer had spread farther ;
“ and on other parts of the former sore might pro-
“ bably be perceived small ulcerations of the
“ same appearance and kind as those of the first
“ discovery, and which went on extending until
“ they united.

“ Five or six days from the appearance of the
“ small ulcer or ulceration, when it had extended
“ (or by its union with other ulceration) over one
“ third of the former sore, with pain and redness in
“ the course of the lymphatics, and the glands
“ through which they led, with enlargement of
“ them, general indisposition of body became evi-
“ dent. This consisted in nausea, loss of appetite,
“ heat of skin, a very small and quick pulse,
“ extreme irritability, a whitish tongue, and thirst.
“ When these symptoms took place, the ulceration
“ rapidly went on, extending beyond the limits of
“ the

“ the former fore, and destroying the adjacent
“ parts. In this state of the fore, the parts were
“ puffed and bloody, accompanied with much
“ uneasiness, having a burning and lancinating
“ sensation ; and the action frequently terminated
“ in apparent gangrene. Sometimes, however,
“ the ulcerating part remained covered with the
“ thick adhesive matter, and gradually without
“ any other apparent change, assumed the healing
“ state.

“ The operation of the poison in slowness or
“ rapidity probably depended on some constitutional
“ circumstance, as it was not in all of equal degrees
“ of facility. These sores, which spread rapidly
“ and extensively to sloughing, and even to gan-
“ grene, from one, two, or more small ulcerations,
“ very likely happened in those who might be said
“ to have a constitutional susceptibility ; while, on
“ the contrary, in those where the ulcerations con-
“ tinued distinct, and remained covered with a
“ thick, whitish, and adhesive matter, without
“ acquiring the sloughing and gangrenous states,
“ their constitutions had no favorable tendency to
“ the operation of the poison.

“ The first favorable change was in the appear-
“ ance on the edges of the fore, with a separation
“ of dead parts, which went on until the whole
“ were thrown off ; and then healthy granulation
“ and cicatrization took place.

“ The most singular phenomena in the progress
“ of this fore consisted in the various actions which
“ were not unfrequently perceived in it at the same

“ time, and which seemed to depend on constitu-
“ tional differences. We have seen the ulcerating,
“ suppurating, and cicatrizing states going on at
“ the same time in one sore. It was not unusual
“ for the ulcerating process to be checked before it
“ had extended over the whole sore, when the
“ former cicatrizing parts went on without inter-
“ ruption; and the ulcerating part, having assumed
“ the disposition to healthy action, arrived at the
“ cicatrizing point, and then proceeded with the
“ others to skinning.

“ The smallness of the ulcer, the appearance of
“ its edge and base, its ulcerative tendency, the
“ absorption of its matter affecting the lymphatic
“ glands and vessels, and then the whole system,
“ pointed out the operation of a *morbid poison*.

“ The action of this poison seemed to be limited,
“ and confined to specific effects; the first were
“ local, producing only general affection by a more
“ extensive operation on the sore, and which in a
“ certain time terminated in the healthful separation
“ of parts, granulation and cicatrization, and a state
“ of constitutional convalescence.

“ Sores having specific actions, as the venereal,
“ scrophulous, and variolous, resisted this poison,
“ and in the hospital were not affected, though such
“ patients were in the same wards.

“ Some men in quarters, one with a blistered
“ part, another with a cut on the outer ear, and
“ another with a sore on the leg, besides several
“ others, were affected with this poison. The
“ men in the same wards were not generally
“ affected

“ affected with it ; those with specific sores, or with
“ sores of small extent, and having little discharge,
“ though laying within two feet of the men under
“ the action of the poison, escaped.

“ From the very serious ravages of this poison,
“ we were induced to make the most particular
“ inquiries. Being fully persuaded it was neither
“ the sore acted upon by *erisipelas*, nor the sore
“ described as peculiar to hospitals, we found our-
“ selves involved in considerable difficulties. We
“ consulted every thing that had been written
“ by the ancients or moderns within our reach, and
“ we found nothing resembling our sore. We
“ saw however similitudes, in some of its stages, to
“ *phagedæna*, especially as it is described by
“ Mr. Adams, in his account of morbid poison.
“ But the local attack on the sore, its progress, and
“ the consequent general indisposition, and changes
“ on the sore, remained new, and to us unnoticed
“ and unexplained.

“ Impressed strongly with the notion that a
“ morbid poison was applied locally to a part of
“ the sore, which, like the venereal poison had
“ the power of assimilation, and thus augmenting
“ its power ; as also of being absorbed, producing
“ general effects on the system, and a re-action on
“ the sore ; we were determined to adopt local
“ means of treatment, consisting in the chemical
“ destruction of the poison, and in part under
“ its direct action, and in exciting a new action.

“ We were led to propose an early and vigorous
“ treatment of the local operation, from observing
“ that

“ that when the constitutional effect took place,
“ any plan of cure was inadequate, the disease then
“ going on, and apparently ceasing of itself ; but
“ but not until very extensive destruction of parts
“ had been accomplished.

“ The oxygenated muriatic acid, and the nitrates
“ of silver and mercury, were the applications
“ employed ; and latterly, the oxygenated muriatic
“ acid gas.

“ When either of these were applied four or five
“ times, the little ulcer soon put on the suppurating
“ state, and granulated. They did not give pain
“ in any degree, and it was of short continuance.
“ While the ulcer was directly touched with the
“ nitrated silver, the whole fore was moistened
“ with a dilute solution of nitrated mercury, or a
“ nixture of the oxygenated muriatic acid in distilled
“ water ; after which the whole was covered with
“ lint that had been previously moistened by æther,
“ or the oxygenated muriatic gas applied to the
“ ulcer, and over the fore the dilute solution of
“ nitrated mercury in distilled water.

“ By these means, diligently persevered in, the
“ poison and ulcer were destroyed, and the fore
“ went on cicatrizing. The only failures were in
“ those cases where the ulceration had so extended
“ that the nitrated silver, oxygenated muriatic acid
“ or gas, could not be completely employed. It
“ is necessary to mention that washing the fore
“ with warm water was always previously per-
“ formed.

“ The

“ The success of this treatment afforded additional strength to the opinion we had formed of the existence of a poison, its locality, and that it possessed, like other poisons, the property of assimilation, or producing matter similar to itself.

“ Having gained this much, we were prepared to make some inquiry into its origin.

“ From the local commencement of the poison, and the power we had of destroying its peculiar nature, and consequent action, by a direct application, and at the same time considering the circumstances of the sore previous to its appearance, we entertained the notion that the poison was formed on the surface or edges of the sore.

“ In all these sores on which the poison showed itself, both in and out of the hospital, the discharge from them was considerable: they were most generally dressed with an ointment of wax and oil spread over coarse linen, and when dressed the matter was seldom cleaned off; by which it formed incrustations about the edge, or at a little distance from the sore. This arose from the opinion of some, that the washing of sores, if it did no harm, was at least superfluous, and from the great number of sores at that time to be daily dressed, by which less attention was probably given than might have been otherwise required and bestowed.

“ We suspected, however, in a few cases, that the poison was propagated from one sore to another

“ ther by means of the sponge employed in the
“ occasional wiping or washing, the same sponge
“ having been unguardedly used for different
“ sores.

“ The discharge of a sore remaining confined,
“ or some of it suffered to adhere long on the edge
“ of the sore, may undergo such changes as to
“ produce a matter possessing new properties of
“ an apparently poisonous nature and effect. On
“ several sores, but one in particular, where a con-
“ siderable quantity of finely-powdered nitrated
“ mercury had been sprinkled, in twelve hours,
“ the time of the next dressing, the mercury formed
“ a shining crust, was firm, and appeared as if a
“ portion of the mercury had been revived. This
“ might be owing to hepatic gas on the surface of
“ the sore.

“ Dr. Crawford, in the eightieth volume of the
“ Philosophical Transactions, p. 391, has made
“ such experiments on the matter of cancer, that
“ there can be little doubt of chemical changes
“ and combinations produced on sores. This is a
“ subject, however, that has not been carried far-
“ ther since then, as it ought to have been. We
“ trust it will gradually appear a subject of great
“ importance, especially as the discovery of the
“ changes the discharge of a sore undergoes will
“ probably point out, at the same time, the remedy
“ for the sore.”

To this account we shall add the remarks made
by Mr. Cruikshank, chemist of the Royal Artillery,
in consequence of experiments instituted for the
purpose

purpose of examining the matter of this sore, from the same work.

“ The matter of this sore is sparingly soluble in
“ water, but readily diffused through it, producing
“ a milky appearance: pure volatile alkali first
“ reduces it to a transparent jelly, and after some
“ time, dissolves the greatest part; a similar effect
“ is produced on pure pus. These solutions are
“ but partially precipitated by acids, particularly
“ the sulphuric. The tincture of litmus and Brasil-
“ wood are not changed by this matter, it does
“ not, therefore, possess either acid or alkaline
“ properties. If to the filtered solution of this
“ matter in distilled water, a little nitrated silver
“ be added, a whitish-coloured precipitate will be
“ produced. Similar precipitates, but much more
“ copious, are occasioned by nitrated and muriated
“ mercury. When pure pus is treated in the
“ same manner, these precipitates, particularly
“ that by muriated mercury, have somewhat of a
“ different appearance, which it would be difficult
“ to describe. The fetid smell is somewhat
“ changed by lime-water, but not destroyed; the
“ sulphuric acid rather increases it; a similar effect
“ is produced by alcohol, and by the alkaline so-
“ lution of arsenic. A decoction of the Peruvian
“ bark does not destroy the fetor. This, how-
“ ever, is effected by the nitrates and muriates of
“ mercury, by the nitrous acid, but most com-
“ pletely by the oxygenated muriatic acid and
“ gas. Nitrated silver produces very little change,
“ either on its colour or smell, a circumstance the
“ more

“ more remarkable, as this salt possesses the property of destroying the most offensive smells, even that of the matter of cancer.

“ It must be allowed that the offensive smell of the matter of this sore is produced by that part of the discharge which is altered from the nature of pure pus; for we know that every ill-conditioned discharge, has more or less smell, while good pus has none. It is a known fact in chemistry, admitting of few exceptions, that a substance cannot have its smell totally destroyed or altered without having its properties changed at the same time. If, therefore, this peculiar matter, by the addition of nitrated or muriated mercury, the oxygenated muriatic acid, &c. should have its smell completely destroyed, there is every reason to believe that its peculiar properties will be so also; and should it be capable in its original state of producing an ill-conditioned action in sores, the addition of such substances might prevent this mischief. If it should be supposed, therefore, that an acrid matter somehow produced on the surface of sores, were capable of producing ulceration of a specific kind, and that this ulceration, like the venereal, should generate more of a nature similar to itself, capable of extending the mischief, and even of bringing on a general affection of the system, some important conclusions might be drawn from these experiments.

“ 1st. It is easy to see, that a sore once clean, might be preserved from the effects of the
“ matter

“ matter alluded to, by washing it at every dressing
 “ with a weak solution of nitrated mercury, or the
 “ oxygenated muriatic acid ; and that even the
 “ generation of such matter might be entirely pre-
 “ vented by the same means.

“ 2d. After the action has taken place, and be-
 “ fore a general disposition is formed, it might
 “ be possible to put a stop to its progress by very
 “ active topical applications, such as should be ca-
 “ pable not only of destroying the specific nature
 “ of the matter generated, but also the action it-
 “ self. From the experiments already related, it
 “ is evident we should prefer in this case the most
 “ active mercurial preparations, such as red pre-
 “ cipitate not entirely deprived of its acid, or the
 “ muriated mercury ; and if an active caustic were
 “ to be employed, we should have recourse to the
 “ strong nitrous acid, applied in Mr. Humpage’s
 “ method, rather than the nitrated silver, especially
 “ as it may have also the effect of changing the na-
 “ ture of the discharge. This consists in dipping
 “ a little lint in the acid, and applying it to the
 “ part : it communicates less pain than any other
 “ caustic, except the nitrate of silver.”

Thus far the ingenious reflections of this scien-
 “ tific chemist. Dr. Rollo then adds, “ On the
 “ whole, though we have supposed the formation
 “ of a new morbid poison, on the surface of cer-
 “ tain sores, under peculiar circumstances or ma-
 “ nagement, yet we are rather inclined to change
 “ the appellation *new*, to a poison which has been
 “ probably *overlooked*. We have seen the com-

“ mencing ulceration remain some days stationary;
 “ we have seen it extending, while the other parts
 “ of the former sore were cicatrizing, and the con-
 “ stitutional effects not taking place until the ul-
 “ ceration had occupied a large part of the sore;
 “ and we have seen that the painful state and ex-
 “ treme sensibility did not occur until the system
 “ was affected. Therefore, it may be presumed,
 “ the early ulceration has been unattended to, and
 “ the state of the sore remarked only by authors,
 “ after it had assumed the appearance of phage-
 “ dœna. For when the ulceration had so spread
 “ as to produce the constitutional affection, and
 “ the consequent rapid changes on the sore, the
 “ character of the virulent sore described as pha-
 “ gedœna was formed.”

The history of Dr. Rollo's ulcer, as it occurred
 in the hospital of the Royal Artillery at Woolwich,
 we thus perceive, bears a strong resemblance to
 ours. It does not, however, appear from the doc-
 tor's narrative, that very recent wounds were apt
 to run into this disposition, and his method of ac-
 counting for the generation of the poison precludes
 this suspicion. This at once confirms some dif-
 ference of character in the two ulcers. It also
 would appear that the sore of the artillery soldier
 never became so formidable as we have seen it
 among the seamen; we cannot, therefore, assign
 any causes sufficiently clear to explain this circum-
 stance. The irregularity of the habits of life
 among sailors were not marked particularly on this
 occasion, and in many cases which we have thought
 the

the worst, these excesses could not be indulged. But if excessive drinking, as in the case of the gonorrhœa in the man belonging to the Saturn, had any effect, it acted more by exciting a violent degree of inflammation, than by exhibiting any other peculiar symptom. We could suspect nothing hurtful in the atmosphere: the seasons have not been remarkable for any unusual constitution: the air of the ships infested with this ulcer was pure and well ventilated, and with all the discipline that conduces to health.

Dr. Rollo has entered into an elaborate investigation of the origin of this morbid poison, and a chemical theory, with a corresponding practice, are the result of his inquiries. We are not disposed to dispute the success of his treatment, but to look for any external noxious power, influencing a diseased action in so many cases of recent venæsection, and other fresh wounds, which have come under our observation, is highly embarrassing. Some cases we have also met with where no previous injury had been offered to even the cuticle, that could ever be suspected or discovered: these began on the fleshy part of the leg and forearm, and were followed with the separation of nearly the whole integuments and muscular parts of the limb. The want of sufficient attention in cleaning the edges of old sores we can scarcely take into our account: few hospitals, we believe, are attended with more punctuality than the sick berths of the Royal Sovereign, Triumph, and the

other ships, and in the necessary duty of dressing we know that they are surpassed by none.

Peculiarities of constitution have not been remarked in our patients; and men who had but lately come to sea were equally sufferers. We did not find that any of them had lately passed severe courses of mercury, which have been supposed to dispose the body to uncommon and obstinate kinds of ulceration; and the suspicion of scurvy was completely out of the question, for the sores never put on that complexion, and the complaint first attracted our notice while the ships were in harbour, and the men feeding on fresh beef, with beer, and abundance of vegetables.

The operation of any specific contagion, either generated or imported, leaves us equally in the dark. If there had been such a cause, the mode of its application is beyond scrutiny: if it could act without actual contact, it must be of too subtle a nature to become familiar to our senses, and renders every attempt at explanation nugatory. The analogy of some other contagions, such as lues venerea, elephantiasis, lepra, psora, &c. cannot apply, for these have each their peculiar action, and their source is easily traced. Ulcers, produced by punctures of dissecting instruments, and proving fatal, may be added to this account.

Whatever doubts and difficulties, however, may appear, we still think some other channels of information ought to be explored. The prevention of so horrid a malady becomes of most serious conse-

consequence, from the numbers of men in the prime of life that have fallen victims to it, and which has deprived their country of their valuable services at this momentous juncture. Whether, therefore, a morbid poison, or a contagious matter, or any other cause, may be considered as producing this ulcer, it is clear, from the history given in our ships, that there is a condition of body, at the time, which renders it susceptible of the noxious power, if this condition of body be not of itself fully adequate to account for the whole. This state, as we have seen it, consists in a high degree of health and strength, the fresh bloom of countenance, plumpness, and firmness of muscle, without obesity, florid blood, with arterial fulness. This is what formerly was called Phlogistic Diathesis, as disposing the body to inflammatory diseases. Such a condition of body is naturally produced from the seamen's diet while in port, when the duty of the ship gives no more exercise than is merely conducive to health. A pneumatic physician will call this a highly oxygenated state of body; but whether this term will be admitted or not, we hold it to be a condition of the body directly opposite to that of sea-scurvy.

That there is a species of ulceration peculiar to a scorbutic diathesis, is a fact as well ascertained as any in the history of disease. That it is produced at sea by a concurrence of causes, but chiefly by a deficiency of recent vegetable matter, we believe to be equally well established. This peculiar kind of ulceration in a scorbutic disposition does not

always require the exciting power of external injury to begin it. We have seen, and have been told, that the cicatrix of an old fore breaks out afresh, and the callus of bones formerly broken is dissolved. Like the ulcer of our inquiry also, the disposition and character of the scorbutic fore are often engrafted on fresh wounds and old ulcers, from whatever cause, till in the end they occupy the whole ulcerated surface, and exhibit their own features only. A scrophulous disposition excites first inflammation, and then ulcers of its own kind. The secondary ulcers of the venereal virus are also produced by a habit of body beginning the diseased action. But the disposition to cancer, the most formidable of all ulcers, is first latent in the habit, and only in its latter stage appears with the character of an open fore. With all these analogies therefore before us, why should we deny that a disposition of body may not also be the main cause of our species of ulcer; and that the fresh wound, as in phlebotomy, the blister, the scald, and burn, with the common fore, were only so many diseased spots, where its action could be more easily put in motion, than on the sound parts of the constitution, that retained the preservative powers of health to secure them against it. The vital fluid oxygenated to a high degree, it appears, imparts singular vigor to the circulating system: the effect of breathing oxygene on a celebrated chemical philosopher*, is well

* Dr. Beddoes.

known: his face in shaving was easily cut, bled profusely, and healed with difficulty. This state approaches to the inflammatory, which, in the part wounded, the bleeding probably prevented. Dr. Rollo has told us, that the morbid poison was first perceived in the edges of healing sores, as a *distinct little ulcer, of a darkish colour, its edges jagged, its bottom unequal and rugged, and discharged a thin matter, having a peculiar smell.* Dr. Browne, in the Royal Sovereign, remarked sores nearly cicatrized, *displaying on the inner edge of the cicatrix a watery bladder, with a dark brown or black spot in the middle.* He emphatically adds, this was the *focus* whence the flame spread. Thus these accurate observers give similar evidence, in first detecting the beginning embryo: but this *black* or *brownish spot*, it is plain, must have undergone previous inflammation, to make it appear in that colour; and the fetid smell perceived showed that the seat of it was now undergoing decomposition. We do not therefore find that there was any need of a foreign poison to excite this inflammation in a sore or wound, with constitutions in such high states of excitement as our patients have been found. The future progress of the ulcer, till the sloughing and fever are finished, is only this course in a larger scale. It seems in its genius, as an ulcer, what the endemic of the West Indies is, as a fever; the stages of high excitement and exhausted sensorial power follow one another so quickly, that we have scarcely time to mark where the one finishes and the other begins. We are not disposed

at present, however, to offer these speculations as a theory of the malignant ulcer ; we have thrown them out rather with a view to excite future inquiry, than to rest satisfied with the knowledge we possess on the subject.

There is another curious peculiarity I have forgot to take into the account of this ulcer ; it is, that on whatever part of the body we have seen it, it never spreads in the form of abscess containing matter in a distinct sac, but constantly proceeds, by hasty strides of ulceration, exhausting and consuming the sensorial power of the parts, till it bring them to final decomposition ; and when this is completed, the surface is in colour very florid, or appears what has been expressively called an *angry look*, with a complexion diametrically the reverse of the scorbutic ulcer.

T R E A T M E N T.

Mr. Cruickshank at Woolwich, following the example of Dr. Crawford on cancer, has made experiments, as transcribed, on the discharge of the ulcer in the hospital of the Royal Artillery. These, we have no doubt, were conducted with the usual address of the able experimentalist : but we are not to expect that the most accurate analysis could develop its qualities. The matter of every sore receives its properties from the living surface
which

which secretes it, if unmixed with the fluid which comes from a lifeless slough not quite separated. The chemist therefore discovers little else but what is common to it with dead animal matter. When the living principle is once extinguished, the *fine, immaterial representative of the Divinity*, where is that Promethean heat to be communicated to the Alembic, or the chemical test of affinities, that can discover the nice dependencies and exquisite changes which matter receives from it, as the prime mover of every action and appetite?

Whether this ulcer be contagious or not, it is a point decided in practice, that the sick berth of a man of war is a very improper situation for such subjects. The attentive surgeon will therefore mark its early disposition to malignity, and send his patient to an hospital on shore, if this be in his power. We might have mentioned in its proper place, that one of the strong arguments in favor of its infectious nature is drawn from the disease running its course in particular ships, while others are entirely free. But it is not always to be demonstrated by what means one ship remains healthy, while another suffers from disease, no more than we can assign reasons why a single person becomes subject to disease, and another not. In the present case it seems sufficiently clear, that a number of men living in one ship, accustomed to the same modes of discipline, and nearly of the same age, feeding on the same kinds of provision, or with less variation than in most other situations of life, are very likely to be attacked with diseases of a
congenial

congenial nature. Thus we seldom see solitary cases of fever, dysentery, catarrh, pneumonia, and ophthalmia in ships; nay, for these reasons, scurvy itself has by some authors been called infectious, by overlooking causes that were general in their operation. The effect of imitation is perhaps more conspicuous among seamen than any other description of mankind: they go early to sea, and as they have fewer changes of object to behold, the manners, motions, and gestures of the elder are quickly copied by the younger. If, therefore, the propensities in health be so strongly marked, why should not the sympathies in disease be of a kindred nature? We are zealous to throw out all these hints, as it was never remarked in the Medusa's hospital, though the different cases of ulcer were mixed as they came on board, and many of the worst kind that has been known, that any patients from other ships were tainted by infection. The common large sores in general healed fast; and some cicatrized in the short space they remained with us. In the naval hospitals there has not occurred one single instance of infection from any ulcer that has been sent on shore, as far as we have been able to learn; and which would appear an *argumentum crucis* against its contagious nature.

We see from Dr. Rollo's practice, that it was the first object to destroy the disposition of the supposed morbid poison in embryo. This practice was more or less ours, though we suspected no such disposing cause as he assigned; and we were directed

directed to do this, merely from the change of appearance on the surface of the sore, to excite the vessels to a healthy secretion, and to facilitate the separation of the slough. Our success, however, was not the same: in our patients there seemed so strong a tendency to inflammatory action in the part, that the application of the nitrate of mercury, even in the very early stage, appeared to do much harm. In one case, on the under part of the forearm, with a view to separate the *black spot* at once by this remedy, so extensive and alarming an inflammation followed, that I attributed much of the mischief to the stimulus of the metallic salt.

In the *secondary sloughs*, I mean such as appeared after the violent fever and inflammatory symptoms were gone, the use of these escharotic applications was singularly exemplified. But the body was now reduced and emaciated, and could bear local and general stimulants not only with impunity, but with advantage.

In such a habit of body as we have described above, large evacuations in the first stage may certainly be safely employed. We would recommend general and topical blood-letting to be entered upon with all the earnestness imaginable; but blood taken from the spot, if practicable with cupping glasses, will be a preferable mode of quickly emptying the neighbouring vessels. These might be repeated in a few hours, till the pain and inflammation are completely subdued. This seems to be the period which, if improved, will save the patient

patient uncalculable torment ; for the size of the floughs, and the ulcerated surface that follow, are in exact proportion to the preceding inflammation and fever. Exposing the limb above the bed-clothes, with only a piece of thin linen over it, and keeping it constantly wet with cold water, would seem to be the best topical application. The cold produced by the evaporation of the fluid will assist in diminishing the action of the blood-vessels, and, by lessening excitement, will ease pain, and contribute to the resolution of the whole. Along with these external means, we would recommend total abstinence, or only the use of weak watery drinks, such as water gruel or tea. Very brisk purges, which induce sudden depletion, must form a part of this plan ; such as a pill of five grains of calomel, washed over with four ounces of the tartarised infusion of senna. This ought to produce six or eight evacuations by stool, in the course of twenty-four hours ; otherwise it should be repeated.

The whole of these means must be sedulously employed till the fever, redness, and heat of the part, as well as the pain, entirely subside.

If, however, these should fail in producing a perfect solution of the disease, they will at least mitigate the symptoms, and lessen the evil. This being the case, the nature of the pain, with the complexion of the affected spot, and with the degree of fever present, will indicate to the attentive observer when a change of treatment becomes

necessary. Warm fomentations and poultices will therefore be required, and recourse to half, or perhaps more of the usual diet, must be had.

Opium, during the inflammatory stage, is heaping fuel on fire, will increase the pain, and add to the febrile heat: it ought never to be resorted to in this condition. But when a benign pus is wanted, and when the pain and restlessness arise more from the gangrenous mass beginning to separate, and the exquisite sensibility of the new surface, from deficient stimulus, then opium will be found to possess its due effects, and resumes its sovereign power to assuage pain and procure sleep. Whenever a sore is in want of stimulant local applications, which experienced surgeons better know than can be described, then also the assistance of opium inwardly, should go hand and hand with the external means the surgeon may use: the propriety of the practice is beyond a doubt; we ourselves have witnessed its wonderful powers on numerous occasions, when bark and wine failed.

With respect to the separation of the mortified, and mortifying mass which we expect to fall off, great attention is required in the position of the limb or posture of the body, to prevent it from irritating the tender sound parts, either by pressure upon them, or by its pendulous situation putting the fibres on the stretch. The scarificator has probably been often rashly employed at this time, with a view, as has been said, to make the sound throw off the decayed portion. The best practice
which

which we have seen is to leave this part of the business to nature, and to direct our attention to keeping the parts clean and free as possible from the mass that is undergoing decomposition. The limb or sore, therefore, ought to be very frequently, sometimes every two or three hours, bathed and washed clean, with water about blood-heat: and should people be fond of adding odoriferous herbs, they may, if they please, mix rosemary, southernwood, &c. in small quantity, so as not to hurt from their acrid quality. At this time, and at all others, the lightest dressings are best.

When the sloughs were thoroughly separated, we have not always found the surface like that of a common ulcer, and to be healed by the same means. The denuded muscle in a single night has sometimes assumed, what we have above called an *angry look*, from having no better term to express it with. It consists of a florid complexion, with strawberry-like granulations, that spring from a narrow root, and the edges of the sore serrated: with these looks the sore never yielded matter sufficient to allow of the spontaneous separation of the dressing; and the removing them was attended with exquisite pain. Diluted spirit or tinct. myrrh. was said by Mr. Galloway, one of our assistants, to answer best as a topical application, but opium was given liberally at the same time. If the ulcers were situated on a fleshy part, these florid granulations would remain a few days; but if near the surface of a bone, their duration was short, and
with

with their falling off or absorption, the periosteum separated, leaving the bone exposed, which in its turn was disposed to caries.

At this stage, and the sore throwing off large masses of corrupted matter, and generally a vast discharge, at the same time a diet, cordial, nourishing, and stimulant, is now of the first importance. Few hospitals could present such a bill of fare, in this branch of the *Materia Medica*, as was found in the lower deck of the *Medusa*: but surgeons in private ships must do the best they can, and our officers have uniformly shared liberally from their tables to the sick.

The contents of the following Essay, communicated to us by Vice-Admiral William Young, one of the Lords Commissioners of Admiralty, we think a valuable addition to the subject which we have been treating, and will be highly acceptable to the navy surgeon, from the respectable authority of its author.—On the Use of the Gastric Juice of Gramenivorous Animals in the Cure of Ulcers, by Dr. John Harnes, physician to his Majesty's fleet in the Mediterranean.

“ Mr. Thomas Corben, boatswain of his Majesty's ship the *Egmont*, was, on the 31st of July, 1796, received into the *Dolphin* hospital-ship, with a scorbutic ulcer on the right leg, the external surface of which was six inches in length, and four in breadth. The surrounding integuments were detached

detached to a considerable distance, and their margin, with the much greater portion of the surface of the ulcer in a sphacelous state. The discharge was so acrid as to destroy every part it came in contact with, and it had insinuated itself through the whole length of the gastronemius and soleus muscles. From between the muscles which were detached from the bones, nearly the whole length of the ulcer, a very large quantity of most offensive matter was discharged; a considerable portion of which lodged in a cyst, formed by the detached integuments on the exterior and inferior part of the leg. There was very great tension of the whole length of the extremity, and the patient's general health was much impaired.

“ In the course of a long and extensive practice, I had been too frequently a witness of the inefficacy of the applications hitherto commonly made use of, in the treatment of scorbutic; such as citric acid, Peruvian bark, myrrh, rhubarb, opium, &c.: and I had more particularly found them inefficacious in warm climates, when erosions and sphacelus had taken place to any considerable extent, which every seaman, laboring under scorbutic diathesis, is particularly subject to from the slightest occasional causes, and which have, in innumerable instances, unavoidably terminated in amputation or death*.

“ From

* It does not appear from the description here given by the ingenious author, that this case was a scorbutic ulcer.

Vide

“ From the very unfavorable appearance of this case, and from being persuaded that it would be found impracticable to effect a cure by any of the above-mentioned remedies, in which my own opinion was corroborated by that of Mr. John Gray, a very ingenious practitioner, and surgeon of the hospital-ship; I was induced to have recourse to the gastric fluid of graminivorous animals, which I knew could be easily obtained from the bullocks and sheep daily killed for the use of the fleet. A bullock being killed in the evening, near three pints of the fluid were obtained, with part of which the surface of the ulcer was washed, as were the whole of the sinuses, by injecting the fluid with a syringe. Superficial dressings of lint were then applied, and particular attention was paid to the application of bandages and compresses, that they might, as much as possible, prevent a

*W*ide Lind's definition in his large work on "Scurvy." We hold it to be a point fully established in practice, that a liberal use of the lemon will *always* correct and alter the disposition of a scorbutic ulcer, without the aid of local applications of the acid, which we think superfluous. The sore may not heal by these means, but it will assume a new character, and the future treatment must be regulated by circumstances, and rules sufficiently understood by the practical surgeon. The qualities of the *succus gastricus* being well known, from the experiments of Spallanzani and others, we are led to infer, that on the surface of ulcers it exerts a stimulant power, being acid and corrosive: the strength, however, must vary in proportion to the long fasting of the animal from whose stomach it is taken.

further insinuation of matter, as well as for the purpose of bringing and preserving the parts as much in opposition as their diseased state would admit of, that every advantage might be derived from the adhesive inflammation, which I expected this application would excite.

“ The third day after this application was begun, upon removing the dressings, the whole of the sphacelated parts came away, and exposed a large portion of the tibia, in two different places. To these pledgets of lint, dipped in the fluid, were applied, which not only appeared to prevent the injuries usually attendant on these cases, discolouration and exfoliation, but, on the contrary, in the course of eight days, the parts thus exposed were covered with granulations; and at the expiration of fourteen days, the whole of the soft parts were perfectly re-united, and the surface of the ulcers reduced to a sore of about two inches and a half diameter, with granulations, small, compact, and of a beautiful florid colour. It is now, Nov. 10, perfectly healed, and the patient, although a very lusty man, enabled, by the assistance of an elastic bandage, to attend the duties of the ship.

“ After the three first dressings, the gastric fluid of the sheep was used; from the ship's being at sea, we were not enabled to obtain any from the bullocks.

“ To remedy this patient's ill health, an aperient medicine was first given; after which he was directed to take half a dram of Peruvian bark in two ounces
of

of the decoction every six hours. He was at the same time directed to make use of as many lemons and onions in the course of the day, as his stomach could easily bear. It was astonishing to observe with what rapidity he gained strength, after the sphacelated parts were thrown off.

“ Since this trial I have had the satisfaction of finding the gastric fluid succeed in more than a hundred instances, where sphacelus had occurred. And the testimonies of its peculiar good effects, in similar cases, by Mr. Jones, surgeon to the naval hospital at Bastia, and by Messrs. Read and Buck, two of his principal assistants, convince me of the propriety of making its efficacy generally known.

“ I have at present a patient in the Dolphin, a seaman belonging to the Barfleur, who, by long confinement in bed, in a typhus fever, became excoriated in three different places, which all terminated in extensive mortifications. The sphacelated parts in this case were entirely removed by the application of the gastric fluid; and the patient is now sufficiently recovered to walk about.

“ *Mediterranean, Nov. 10, 1796.*”

A few trials of this practice were made on board the hospital-ship Medusa at sea, on our ulcers, by the gastric juice of the sheep that had been killed for the use of the sick; but too small a quantity was obtained at a time to give it a fair chance of success. We however hope, that when opportu-

nities may offer, the surgeons in the Channel will not fail to have recourse to this approved method of treating foul ulcers.

The following communication is extracted from a letter to Dr. Garthshore, from Mr. Hammick junior, of the Royal Hospital at Plymouth. We quote it with the more pleasure, as it comes from among ourselves, and has been laudably employed for the relief of our people. The author has been lately known by his experiments on the nitric acid in the cure of lues venerea. With much satisfaction we receive every improvement that originates in a naval hospital: it is the first field that we are acquainted with for observation; and we sincerely wish that the inquiring genius of Mr. Hammick may be generally imitated by his peers.

“ Having obtained permission from Dr. Geach, senior surgeon of this hospital, whose kindness and excellent advice I experience on every occasion, to make trial of common hops in those wards which I attend as his assistant; I have now the satisfaction of declaring, that during the last six months I have seen very good effects from hops in poultices and fomentations, applied to ulcers of the worst kind, in more than sixty patients received from the ships of war into this hospital. Some of the ulcers proceeded from scurvy, and some from other causes. But though all of them have been sordid, fetid, and extensive, yet the fetor has soon been corrected by these applications, and the ulcers have ceased to spread.

“ A large

“ A large handful of hops are to be boiled in a quart of water, till a strong decoction be formed. (Oatmeal with lard or oil is then to be mixed with the hops and the decoction, till the poultice become of a proper consistence. The poultice is then applied to the ulcer without any intervening lint. But previously to this application, the ulcers are directed to be well fomented with the decoction. The pain proceeding from the ulcers is soon alleviated, and the ulcers themselves soon cease to spread. They become clean, and in a state to be dressed with lint or any soft ointment.

“ As I do not know that hops in the cure of ulcers have ever been recommended, and as I am desirous that the use of this application should not be confined to this hospital, I beg you will honour me so far as to communicate this report to any of your learned friends, who may be induced to bring this practice to the test of experience, and to extend it still farther.”

P. S. Mr. Moffat's last communication to me was about the end of October. In this he says, “ It is with pleasure I acquaint you, that the ulcers formerly noticed, have received a very sensible check from the cold weather lately set in; previous to which it had exceeded its usual virulence, almost beyond belief. Wherever the skin was broken, whether by bleeding, blistering, accidents, or any other means, an in-

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“ inflammation

“ inflammation and violent fever soon commenced,
 “ eating away the surrounding soft parts to an
 “ immense extent, and in depth only stopped by
 “ the bones. Fifteen were sent to the hospital-
 “ ship at Cork, and three more will be sent on
 “ shore to Plymouth; which are the only bad
 “ cases these three weeks.

“ I still persevere in the antiphlogistic plan:
 “ but I must confess that, till aided with a cooler
 “ state of the atmosphere, nothing availed much.
 “ I am uncertain whether I ever observed that a
 “ constant reaching to vomit almost always ac-
 “ companied the inflammatory state. December
 “ 8th; no fresh cases.”

Mr. Carter of the *Glory*, on the date of the
 3d of December says, “ My ulcers now look
 “ clean and healing; few fresh cases for some time
 “ past; and the disposition quite changed from
 “ what it was in the summer months. I received
 “ great benefit from calomel.” It is, however,
 to be observed, Mr. Carter’s cases were in general
 less violent than in the *Royal Sovereign* and
Triumph.

Dr. Browne of the *Royal Sovereign*, December
 4th, says, “ My ulcers are certainly better, which
 “ I am inclined to impute to the change of wea-
 “ ther, as my friend Mr. Moffat has done.” He,
 however, found them become worse as fresh pro-
 visions were done, at sea; this had been only
 from the want of due support during the debi-
 litated state. The doctor adds, that he had re-
 ceived very great benefit from calomel and anti-
 mony

mony in the sphacelating stage. He has still nine ulcers, but only one confined to bed.

These accounts all agree in one thing, to wit, benefit from a cool atmosphere; and this throws considerable light on the nature of the ulcer in its first stage, and supports the opinion most approved in the practice at the early commencement of inflammation.

MEDICINA NAUTICA.

EXPERIMENTS ON THE NITROUS GAS OF DR. J. C. SMYTH:

Effect on Ulcers—on Blood and Animals.—Curious Particulars in dissecting a Cameleon killed by this Vapor.—Inefficacy of the Gas in destroying a Contagion on board the Centaur :

By Mr. JAMES REILLY,
Surgeon of his Majesty's Ship Prince.

ON the 10th of November an opportunity offered of trying the effects of this grand specific on ulcers, which I most eagerly availed myself of, by exposing the ulcers to the influence of the vapour, after previously cleansing them. I shall take the liberty here of mentioning the space I tried the experiments in, which was the sick-berth of his Majesty's ship Prince, thirty-two feet long, eleven feet wide, and six feet six inches high, and at the same time particularise some few of the cases at the time of their reception in the berth for cure, as well as the number of pipkins I employed daily.

Thomas

Thomas Hammond, a seaman, aged about thirty years, was admitted for cure on the 10th of November. He had at that time an ulcer on the posterior and inferior part of his right leg, extending about two inches by an inch and a half, with a thin sanious discharge.

Edward Gleeson, a seaman, aged about twenty-eight years, for an ulcer on the superior and anterior extremity of the tibia. This ulcer originated in consequence of a scratch he had received about six weeks before. At this time the discharge was thin and copious, in which state it had been for the space of a fortnight prior to his reception in the sick-berth.

John Woodman, a boy about fifteen years old, for an ulcer on the maleolus internus of his right leg, which extended about four inches in circumference. This ulcer degenerated from a wound that he had received about three weeks before.

Edward Colly, a seaman, aged about thirty-five years, for an ulcer on the anterior and inferior extremity of the tibia. This ulcer he got when his Majesty's ship *L'Eagle* was lost on Plane Island off Cape Farina on the 18th of July 1798, by being driven on a rock. At this time it was superficial, with a slight degree of inflammation.

Matthew Bendall, a marine, aged about twenty-five years, with an ulcer on the superior extremity of the tibia. This ulcer was extensive, with a thin sanious discharge; but the man of a healthy robust habit.

After

After collecting the men with ulcers in the berth, I lighted three pipkins, the vapour of which I did not find adequate to the space; after which I lighted five every morning, and repeated them twice, which completely filled the berth with the vapour for the space of fifteen minutes, where I had all the ulcers exposed. After fumigating, I observed a slight discharge, from each of the ulcers, of a yellow colour. The men attending the pipkins, if they unguardedly opened their mouths, it excited coughing, and very often sneezing. One of the assistants in the berth had a bird, which I begged he might allow to continue during the time of fumigating. The poor bird was sadly agitated all the first morning, but felt its effects less daily. On the 11th, it had the same effect on the ulcers as on the preceding day, with nearly the same on the bird and assistants. On the 12th, I took with me to the berth a boy belonging to one of the people, about five years old: after I gave the boy a handkerchief to stop his mouth and nose with, he thought it good sport, and daily solicited for leave to go, as he was pleased to call it, to fight the Spaniards. The ulcers this day produced nothing singular in their appearance. On the 13th, I remarked, after fumigating, that my hat was of a violet colour, in which state it remained for nearly an hour after, but on wiping it with a towel, and exposing it to the air, I found it return nearly to its former colour. Black cloth it changed and French blues very materially; but the hats, after

after being five or six mornings exposed to the vapour, were left worth nothing. On the 14th I observed Bendall's leg different to what it had been on the former days, with a slight degree of inflammation: the boy and bird, as well as the other men, apparently felt its effects less every day, but always with pleasure extended their lungs at the free admission of atmospheric air. On the 15th the ulcers continued as on the preceding day. On the 16th, all the ulcers, except Bendall's, appeared stationary, but in his the inflammation daily increased. On the 17th, the inflammation increased so much in Bendall's leg, that I was obliged to have recourse to emollient and cooling applications, forbidding his attendance in the berth until such time as the inflammation subsided. On the 18th, Gleeson's ulcer appeared much inflamed, which inflammation extended to every part of his leg. Him I had also to caution against attending until such time as the inflammation abated. On the 19th, I exposed blood to the vapour, and at the same time exposed blood to the influence of atmospheric air. On comparing the blood exposed to the vapour with that in the open air, I observed the blood in the open air to be two shades lighter or more florid than that exposed to the vapour. At this time the thermometer was at 60; the ulcers, except Bendall's and Gleeson's, stationary; the boy I observed to have a degree of stupor on him, with a loss of appetite; the bird, which was a chaffinch and of handsome plumage, now became nearly of a dark blue colour, with a diminution

nution of size. On the 20th, I inflated the lungs of a goat with a small portion of the vapour joined with atmospheric air, without having had a more sensible effect on the animal than that of inducing drowsiness. The ulcers continue stationary, except Bendall's and Gleeson's; the boy drowsy, and the bird daily became bluer, and diminished in size. This day I tried its effect on blood, which produced similar to that on the preceding day: thermometer at 59. On the 21st, 22d, and 23d, I tried my experiments as on the preceding days, which produced similar effects. By this time, with the use of emollient cataplasms and an antiphlogistic regimen, Bendall's and Gleeson's ulcers were well enough to be re-admitted. On the 24th, Colly's leg, and Hammond's, were much inflamed, and their ulcers increased in size. On the 25th, the inflammation increased to a very high degree in Colly's leg, and Hammond's. My experiments on the blood and goat were as on former days. On the 26th, every thing appeared as on the 25th. On the 27th, all the ulcers appeared to spread with a considerable degree of inflammation, with a quick small pulse and apparent symptoms of indirect debility on the men, as well as the loss of their usual healthy colour; the languor increased so much on the boy, that I could not with safety bring him with me any longer; the bird decreased in size, and assumed a darker blue; the blood as on former days. On the 29th, the ulcers increased in size, and the men became more debilitated. On the 30th, John Woodman, in holding one of
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The pipkins, applied the vapour too close to his leg, which excited a violent degree of inflammation, but with the frequent use of emollient cataplasms, the inflammation subsided, and the ulcer healed over by the 10th of December. I beg leave to remark that this is not an uncommon occurrence in indolent cases, for I am satisfied that four times out of five, if no predisposing cause exist in the habit, that the application of caustic to ulcers will produce a cure, which acts in a similar way by inducing an increased excitability of the part. All the other men continue worse, their ulcers increase in size and themselves in debility, which obliged me, on the 12th, to leave off fumigating.

About the time I commenced my experiments, Mr. Pritchard, master of his Majesty's ship Prince, presented me with a cameleon, that had been sent him by a gentleman from Saffia in Barbary, which extraordinary production of Nature I remarked with particular attention every morning after fumigating. On the admission of atmospheric air I had this animal brought into the berth, and as regularly observed his colour change to a variegated black, which in no small degree excited my curiosity: unthinkingly, I one morning allowed it to remain in the berth during the fumigating process, which, I am sorry to say, ended its existence. I found, when it was dead, its colour was black, the reason of which I shall attempt to explain. As this animal is not known in England, I examined the comparative anatomy of the thorax and abdominal viscera, these being
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the only parts I dissected, having stuffed his body : which will fully account for the singular phenomenon that takes place in its changing to the same colour with the object placed before it. On opening to view the thorax and abdomen, there appears no mediastinum, but a thorough communication, without any intervening substance ; the whole space of which is filled by three bladders, the middle and smallest of them may be called with propriety the œsophagus and stomach. It is firmly attached to the os hyoides, and terminates in the anus. The other two bladders are attached to the thrahea, and in every respect perform the office of lungs. And the animal can at discretion fill itself out to a large size, by inflating these vesicles, which are extremely pelucid, and, when inflated, fill completely the whole of the abdominal cavity ; where there is no other substance but these transparent membranes. And the change of colour that takes place is occasioned by the reflection of any other colour on these transparent membranes, as the skin of the animal is extremely thin, and between the cellular substance and the skin is a filamentary expansion of the membranes ; which pellucid or transparent membrane serves as a lens or mirror to reflect the rays of colour when objects are placed before it. A very clear demonstration of this is, that when a collapse takes place, which is not unfrequent, it is not influenced by colour ; and on the contrary, when these bladders are full, its colour is influenced by the object placed in competition, but scarlet more particularly from its
being

being more vivid. I doubt much whether Nature has designed this animal to live on food or not, from the following circumstance; that I very frequently gave it flies, which it never appeared to swallow with avidity; and I believe, if it were possessed of the power of returning them, that it should have done so: and in dissecting it I found the whole of the flies unaltered in this middle space; and as a farther proof, from the part of the cyst where the flies were, to its termination, was so closely filled with bezoar-mineral, that the most minute substance could not have passed. This, in my opinion, clearly proves that Nature did not design it to live on food; or if it had, that its faeces were of the bezoar mineral.

The tongue of this extraordinary animal is seven inches long, and in appearance like the sucker of a pump, with two apertures. The expansion of the nerves are beautiful, having no muscular substance to cover their colour: I counted distinctly twenty-nine pair; they in every degree perform the office of muscles, and all motion is performed by them the same as by the muscles in other animals: the eyes are of a very particular structure; they are very prominent, with a small pupil; and the animal can look forward with one, and back with the other at the same time. Its colour, when not influenced by objects, is a bluish grey, beautifully variegated with small yellow spots; its body about seven inches long; its head about an inch and one half, handsomely helmeted; its tail about five inches long, which it makes as much use of as any
of

of its legs, particularly when descending from heights; it is of the oviparous class, resembles much, only smaller and handsomer, the gauana of the West Indies.

In all my remarks on blood exposed to the vapour, I found it two shades darker in colour than the blood exposed to the influence of atmospheric air; and the *crasis* of the blood exposed to the vapour was at all times destroyed. If the thermometer were high, with any thing of a smart breeze of wind, the blood exposed to the influence of atmospheric air became three shades lighter or more florid than the blood exposed to the vapour. From these remarks we may presume to infer, that the vapour does not impart oxygene to inorganic bodies; and the effects produced on the boy and the bird clearly prove that it does not impart oxygene to the organized fibre: and the debility induced on myself as well as the men, with the death of the cameleon, plainly prove it inimical to animated Nature: for although I have not mentioned it in the former part of this narrative, yet I felt, after the first fortnight's attendance, a very unpleasant languor on me, with a loss of appetite, and a depression of animal spirits. So apparent was this state marked in my countenance, as well as my feeling very strongly its effects, that the gentlemen of the ward-room frequently remarked to me the change produced in my appearance, and as often requested me to suspend the fumigating process. This I certainly should have done, had it not been for the pressing solicitations of some of my

my medical friends, as well as my own great wish to be in possession of facts that should enable me to decide on the virtues of the vapour ; in every one of which I found it fall far short of the wished-for effect ; and in no one case of ulcer did it produce salutary effects, but, on the contrary, appeared to do great mischief.

Mr. Reilly concludes his communication with some remarks on the inefficacy of fumigation in destroying contagion on board the Centaur. This ship was lately commissioned, and carried, from the coast of Ireland, where she had been cruising, an infectious fever. She sailed from the coast of Ireland with Sir Roger Curtis, whose speedy junction with Lord St. Vincent, on the 25th of May, enabled that great commander to dispatch other ships to join Lord Nelson. All the usual routine of fumigation was practised in this ship ; the very hold was unstowed and cleared for the purpose. Nor was it subdued before the month of August, which was at last effected by a fresh supply of cloathing and bedding ; and all the old wearing-apparel of the people was not only washed, but boiled in water,

The advocates for the use of *unrespirable gases* must blush, when they see the business of purification thus taken out of their hands ; and their practice, when adhered to, made an engine of torture among a ship's company. With such examples before their eyes, we trust officers will

disclaim the surrender of their fine discipline for the *monstrous quackery* of any fumigating process*.

We read with delight the kind regard for the health and comfort of the fever patients, bestowed by Captain Markham in this sickly state of his ship, by supplying them with all the dainties of his table.

P. S. It is to be observed that Mr. Reilly's trials of the nitrous vapour, as well as those of Dr. Browne in the Royal Sovereign, and Mr. Moffat in the Triumph, were made in consequence of a letter from Mr. Paterfon being circulated in print by the Commissioners of Sick and Wounded throughout the navy. We might have been content that these trials fully *confute* the practice; but that letter being now published, and accompanied with an introduction that magnifies its importance, in Duncan's "Medical Annals for 1798," we think it proper to guard our surgeons against some of its arguments.

This gentleman speaks of fumigation and ventilation in the same breath; and adds, that the one will not do without the other. Here at once is the grossest misapplication of principle and language; for by ventilation you admit pure air, and by fumi-

* In this instance it is but fair to conclude, that the infection was *prolonged* by the diffusion of *poisonous airs*, from fumigation, in a season and climate otherwise so favorable for subduing it,

gation you introduce foul air. Mr. Paterfon says he found the nitrous vapour pleasant : chemical authorities say it is “ destructive to animals.” Cleanliness he also admits to be useful : now cleanliness and nitrous vapour are in direct opposition ; for chemists say nitrous gas destroys the texture of all *animal substances* used in cloathing, and decomposes the wool, silk, hair, and the colouring matter. Mr. P. did not perceive his cloathes affected ; but Mr. Reilly observed, as all chemists have done, that the colour of his hat and other articles were altered by the vapour. Mr. Paterfon is in hopes that my “ *ill-grounded fears*” will be now removed. Mr. P.’s letter has deeper rooted my dislike to the practice ; for there is not a clear fact in the whole performance. We should like to have seen this report dated officially from Forton Prison. Has Mr. Paterfon heard the *doubts* entertained on the subject by his coadjutors there ?

We have a right to expect that nitrous vapor may occasionally be a very useful stimulant to indolent ulcers, like the diluted acid mentioned by Mr. Home ; and here we think Mr. P. ought to have paused, rather than introduced an unmeaning *eulogy* on a medicine, whose exhibition has not yet, even by its warmest supporters, been defended on either medical or chemical principles.

There is something extremely cruel in diffusing this gas among a number of men debilitated by bad ulcers in a confined sick-berth : yet to excite coughing, and in some instances vomiting, are not deemed severe, when compared with the good effect of destroying a bad smell.

We have just been informed by Sir Roger Curtis, under whose flag Mr. Reilly is surgeon, that if the experiments had not been given up, the patients and experimentors must have quickly perished.


We, however, think that practice the best where the hepatic gas and hepatised ammonia are prevented from accumulating, by perfect cleanliness, frequent dressings, ablution, and pure ventilation. When these are earnestly attended to, nothing very offensive can be produced.

In the same letter we observe an allusion to a medicine called *acetum nitrosum*, a solution of salt-petre in vinegar. The original introduction of this medicine was in Mr. Paterfon's Treatise on Scurvy.

The practice is defended on the theory of the "*privation of oxygene.*" But the success here narrated is so completely repugnant to known experience, that we were led to make further inquiries in the ship where the disease is said to have appeared. I have now the authority of Captain Pendar and his officers to say, that they were astonished on finding a book published, with the account of scurvy on board the Resolution, where it was *impossible* such an occurrence could take place without their knowledge; and they *never* heard of it before. A scurvy, where upwards of 200 lbs. of salt-petre were taken for the cure, could not well happen without officers hearing of it! We suspect the mistake to have originated from the exhibition of the medicine in some very slight cases.

Mr,

Mr. P. in that work says his patients recovered sooner from the acet. nitros. than from lime-juice: *credent posteri?* Captain Charles Rowley was requested to certify some cures in a ship he commanded; but he declined by saying, they were cured by refreshments from his table. This much, in justice to service, we consider our duty to make public.



MEDICINA NAUTICA.

CASE I.

A large FRACTURE of the CRANIUM, successfully treated,

By Mr. CORNELIUS REYNOLDS,
Surgeon of his Majesty's Ship Blenheim.

WILLIAM Billingham, boy, aged about fifteen years, falling down a hatchway, fractured the cranium about nine inches in length, commencing at the left pars squamosa of the temporal bone, and extending along the coronal suture in a straight line. Upon the os parietale, at this place, the detached pericranium was first discovered, which being dissected, and retained by an assistant, I then observed the cranium as if totally separated at the suture, and could with my finger trace this chasm downwards. I immediately pursued with the scalpel till I came to the ear. The wound was most formidable in its appearance, being on the vertical part depressed, much shattered, and in its whole length the pulsations of

the membranes and brain were unusually hard. Having dissected the much-injured pericranium, totally free of the fracture, in all its directions and sides, I applied the largest-sized trepan on the depressed part, and removed that first. But as the uncommon length of the fracture totally forbade the removal of the cranium its whole length, and as the magnitude of the separation was such as to allow of the most complete exit to any fluid, either from hemorrhagy or pus, that might be judged necessary, I applied the same instrument to the other extremity of the fracture, and removed the piece. A copious hemorrhagy ensued, which I did not endeavour to restrain, the boy being of the sanguineous temperament, and considerable concussion as well as fracture. The wound was dressed lightly; pieces of adhesive plaster were laid across at distances; and a very large cold poultice of oatmeal and a solution of ceruss. acetat. was laid over the whole. He took an opiate draught and was put to bed. I may here observe, that the wound, when cleaned after the operation, resembled a straight line, with two ovals, one at each end thus, ○————○.

The animal functions are a good deal impaired, breathing laborious, pulse quick and hard, with subsultus tendinum.

Hab. enema aperiens statim. et
mittatur sang. ad ʒxij.

Bibat ad libitum ex aq. hordeata cum succo lemo-
nis recentis ad gratam aciditatem.

R 4

2d day.

2d day. Symptoms are relieved since yesterday; breathing less difficult and laborious.

R Haust. opiatum, hora somni
Bibat ad libitum ut antea.

3d. The febrile symptoms are abated, though the irritability is still considerable: his rest is interrupted by frequent startings, and during the day he seems comatose, rather than sleepy.

R Haust. opiatum.

Ordered him a little mutton broth, and half a glass of wine and water. Dressed the wound simply, which has begun to digest.

4th. The patient begins to sleep naturally; in short every function is resuming its natural office. The wound is digesting kindly: let him have simple dressings. Ate a bit of mutton for dinner. Continuentur med.

5th. As yesterday.

From this time no very particular treatment became requisite, except some trifling variety in the dressings, as fungous excrescences, &c. occasionally presented.

Whatever may be the result time only can show; but at this moment the boy seems in every respect as perfect in all the senses as he was previous to the accident. The wound is now cicatrized, and pretty well defended by the callosity of the renovated

vated pericranium: but perhaps a gold or silver plate would be advantageously applied over the tender surface.

Blenheim, at sea, August 1796.

C A S E II.

FRACTURE of the RIGHT ARM, AMPUTATION of the RIGHT FORE-ARM and LEFT HAND, attended with uncommon Symptoms; with the SCORCHING of the FACE, HEAD, and BREAST, from the Explosion of Gunpowder; successfully treated,

By MR. ROBERT DUNN,
Surgeon of his Majesty's Ship *Stag*.

Daniel Leary, seaman, belonging to his Majesty's ship *Circe*, was, by the explosion of a great gun, in the act of reloading, thrown into the main chains, where he was discovered in the most melancholy plight that ever human being was exposed to. When called to examine him, both arms appeared to be carried away, with a fracture of the humerus, near the axilla of the right arm: his face, breast, and head, were scorched all over in the most shocking manner, and there seemed scarce any remains of life: in short, so hideous a spectacle has seldom appeared; and under such sufferings, there were
very

very slight hopes that any thing could be done for his relief.

There is something, however, in the worst of evils, which induces the surgeon to stand forward with zeal, in spite of the most discouraging circumstances; and in this instance it was rewarded with success. While the helpless patient continued in a swoon, the left hand was removed at the carpus. During this process, signs of returning sensation were evident; and before the arm was disposed of, he was aware of his situation. The arm presented a most awful prospect, and interested me much: for the rational state, which was now every moment increasing, was an additional motive to persevere still farther, in hopes of saving him.

He was, by this time, thoroughly sensible of his misery, and from the fracture being so near the scapula, he was told the necessity of losing the arm at the shoulder joint. All the violence and obstinacy which seamen exhibit on some occasions, were shown by this poor man in opposition to my wishes; and every intreaty he could use was urged in the most earnest manner to save as much of the arm as possible; or if all would not do, he was content to die in the way he was.

After using every argument with him in vain, he became still more unruly, and called for Captain Yorke to assist him, in setting forth his wishes. The inconsistency of operating below a fracture, and apparently in one of the worst of cases, was kindly enforced by Captain Yorke, in addition to
every

every thing I could say. But all was of no avail, and without hesitating any longer, it was determined that this pitiable object should be managed in the following manner, although it was transgressing some of the rules of surgery. On minute examination of the right humerus, the fracture appeared transverse, without any laceration, or much contusion, as far down as the elbow. The bones of the lower arm were shattered and robbed of all their integuments and muscles, to within a hand's breadth of the cubitus, where all appeared pretty sound; and there it was determined to operate.

The shock communicated to the vessels, had prevented any considerable degree of hemorrhage all this time; and very slight compression by tourniquet was used during the operation. The bones were found perfectly firm to the saw, and four blood-vessels required securing. The rest of the operation was soon finished, and the arm placed in the easiest position, with a moderate compression on the fracture of the upper arm by a tailed bandage. Two grains of opium were given him; cold embrocations were constantly applied to the arms, and watched and attended to with the greatest anxiety. His face and breast were moistened with oil; his eyes were closed, and the head enlarged prodigiously: but with all these evils, he continued rational in his conversation, and rejoiced that he had not been, what he called, *lumped short* in the service.

Every

Every hour increased our hopes about him: Captain Yorke and the officers gave him every consolation by their frequent and attentive visits, which tended greatly to heighten his natural firmness of mind, and to banish every thought about his safety. Neither hemorrhage or any untoward symptom intervened: the left arm was looked at, and dressed the third day; was healing without suppuration, and scarcely any tension whatever. The other arm was considerably enlarged from the fracture downwards; the outer dressings were, therefore, removed, and every thing left loose about it.

Very little fever ensued, although he was in the most exquisite pain from the scorched state of his body. Wine and soup were given him in tolerable quantities for three days, when on our arrival at Spithead he was sent on shore to the hospital, where, by the active attention and humane care of Mr. Dods and the gentlemen under him, this man was preserved. In the course of two months both arms were completely healed, and the fracture united. In return for the loss of an eye, with his other calamities, he enjoys a pension of 20*l.* *per ann.* from the chest of Chatham, with a cook's berth in a ship of the line building.

It should not be unnoticed, that the regard which seamen have for each other in distress was strongly exemplified in this instance. No sooner had the maimed sailor appeared once more among his shipmates, than their zeal to compassionate his misery

misery was set forth in their usual way to render him service. A subscription to the amount of twenty pounds and upwards was collected on board, in a few hours, to which a handsome addition was made by the officers.

Stag, Spithead, Feb. 28th, 1798.

This hardy son of the ocean lately paid me a visit in compliment to the abilities of his excellent surgeon. He follows the employment of flogman, and attends the ships at pay-day, where he outstrips every competitor in the number of customers. Though maimed, and blind of an eye, the hardihood of a sea education is unsubdued by his misfortune. He said, "I still receive king's pay, and am, thank God, hearty and well."


T. T.

C A S E III.

Case of a FRACTURED SKULL, successfully treated,

By Mr. R. CARRUTHERS, Surgeon of the
Unicorn.

Thomas Cooling, a landsman, aged 21 years, five feet nine inches high, slightly made, of a fair complexion, had the misfortune to fall one hundred feet perpendicular, on the 31st day of March 1797. He was immediately taken up by some of his companions,

companions, perfectly senseless, and apparently a corpse, every person giving him up for a dead man. I was called to his assistance, and on my arrival found him seized with vomitings and hemorrhagy from his nose, his abdomen violently contused, and a wound on the right side of his head; the bigness of a horse's bean of the cortical substance of the brain was thrown out by the fall, which, as it was wholly detached, I removed gently with my spatula: on applying my hand, I found nearly one half of the cranium fractured, and somewhat depressed, his pulse greatly oppressed, and comatose symptoms very high. I cut off all his hair, and shaved his head, made an incision with my scalpel from the wound on the coronal suture to the lambdoidal, where the fracture terminated, and brought the whole into view (the fractures were not unlike this mark ).

He had lost a great deal of blood from the wound and nose, which superseded, for the present, phlebotomy. As there was no time to be lost, I determined upon the operation shortly afterwards; applied the trephine at the extremity of the fracture, on the *os parietis* near to the *occiput*, where the depression was; removed the circular piece of bone, and with my elevator raised the depressed portion of bone and found a quantity of effused blood upon the *dura mater*, which I carefully discharged; applied emollient dressings, and se-

* Where the trephine was applied.

cured the whole by the *grand kerchief* bandage; I administered an infusion of fenna with manna, and a solution of natron. vitriol. as by this time he had recovered his senses, so as to speak to the attendants about him. From this time to the 4th day of April he remained easy and free from any unpleasant symptoms: the draught procured him four purging stools, and to my surprise he voided three long worms of the tenia kind. The 5th I removed the dressings, and found a favorable discharge of laudable pus. The 8th he passed a restless night, and in the morning found his skin very hot, pulse very quick and full; took away ten ounces of blood, and repeated the cathartic draught. From this to the beginning of September, he got daily better; the cranium had finished exfoliating; and when I saw him last, the wounds were cicatrized, and as well as if nothing had happened, having followed my directions as to his diet, which consisted chiefly of light, thin, nutritious soups, observing strictly an antiphlogistic regimen throughout the whole cure.

Cove of Cork, May 1798.

This case was accompanied by a letter from Capt. Young, in testimony of the high opinion he entertained of Mr. Carruthers' abilities, humanity, and attention in discharging the duties of his station to the crew of the Unicorn.

T. T.

CASE IV.

*A Succession of large ABSCESSSES on the upper Part
of the THIGH, successfully treated,*

By Mr. ROBERT CARRUTHERS, Surgeon of
his Majesty's Ship Unicorn.

John Honeyball, a seaman, aged 28 years, complained to me, on the 7th of March 1798, of a severe pain on the inside of the right thigh, about four inches below the groin, which he says had troubled him for five or six days without any known cause. He was of a full habit of body, pulse full and natural, tongue clean, gums livid, and discharge blood upon the least pressure, other functions tolerably good; says he had often been affected with lues venerea, and never properly cured; has lived for some time past on salt provisions; is addicted to all kinds of debauchery whenever an opportunity offers.

Upon examining the thigh a large tumor appeared about the seat of the pain; it was greatly inflamed; the heat and throbbing pains were so violent as to prevent him taking any sleep; and it frequently caused him to make an hideous noise.

I ordered him to be kept to his bed, and a warm emollient cataplasm to be applied to the part affected, and desired it to be repeated four times in the twenty-four hours: I administered one grain
of

of opium every night at bed-time, and gave him an ounce of lime-juice two or three times every day, diluted with water, and sweetened with soft sugar: no symptom of venereal affection whatever has been observed on any part of his body.

For several days the suppuration went on rapidly: a deep-seated fluctuation was then felt under the skin and muscles, the tumor had increased to an enormous size, and the cold shiverings now became very severe: about this time several smaller tumors likewise appeared on different parts of the thigh; and notwithstanding all discutients were applied, they advanced greatly in size.

I now opened the first of these tumors, by making an incision nearly the whole of its length, and discharged about ℥ij. of black, fetid pus, by which he was greatly relieved: digestive dressings were then applied, and a warm cataplasm over all. He now took gutt. * * * tinct. opii ph. l. to procure sleep. In a few days a second tumor was treated in the same manner: he took his lime-juice as before directed, and his bowels were kept gently open. His right groin now began to swell, and continued to increase in size for several days, seemingly from the absorption of the matter from the abscesses in the thigh; a great degree of hardness prevailed all about the wounds, which now began to contract, although the suppuration continued copious. I therefore enlarged them with a probe-

pointed bistoury, and began to give the bark with wine freely. He lived chiefly upon thin soups and a vegetable diet, which he received daily from Capt. Young's table. Another large abscess now appeared upon the upper part of the vastus internus muscle: it was also opened, and discharged a lbj of good pus; his allowance of bark and wine was now increased, as his pulse became feeble and very frequent; however, all hardness began to disappear from the thigh, and the cataplasms were omitted: in a few days suppuration likewise gradually decreased, the tumor in the groin disappeared, and he now began to recover his natural sleep and appetite; his pulse recovered strength daily, and the wounds in his thigh in a short time were cicatrized. He continued to do well, and returned to his duty in five weeks after the first attack; and he continues now in perfect health.

R. CARRUTHERS, Surgeon.

Unicorn, Cove of Cork,

Dec. 12, 1798.

C A S E V.

*Of LOCKED JAW, from a Wound, communicated in
a Letter to Dr. TROTTER, successfully treated,*

By Mr. RALPH CUMING, Surgeon of
his Majesty's Ship Hind.

" S I R,

Bahama, Aug. 5, 1798.

" After perusing your very valuable and edifying publication, styled *MEDICINA NAUTICA*, and finding therein that you are desirous the Navy Surgeons should communicate to you the result of their practice in particular cases, I have transmitted you one which occurred on board his Majesty's ship Hind, now employed in America; and I myself conceive it to be a duty so indispensable and incumbent, that, were we to fail in doing it, we should be unworthy of holding so responsible a situation, where so much trust is reposed in us, and where the safety, welfare, and prosperity of the British nation in a certain degree hinges. These considerations ought to be a sufficient excitement in us to cause our medical communications to become more general, more especially as our practice in the Navy, both in Surgery and Physic, is frequently very extensive, for reasons the most obvious; and as the service has profited so much from the preservation of men's health, and our improved mode of treating diseases, it is to be hoped that our situations will be made more eligible and suitable

to the character we have a right to maintain in the grand theatre of life. And you, Sir, permit me to say, are entitled to the highest encomiums for your assiduous and unremitted attention to the duties of your profession; for I don't know any one who has contributed so much towards improvements in our department as yourself; and as merit in general rewards itself, I trust yours will meet with the countenance and support it so justly deserves.

"April 21, 1798. Edward Morrison, seaman, aged 20, in running along the main deck, chanced to step upon an old plank, and run a rusty copper nail into his foot, between the fourth and fifth metatarsal bones. Two or three days elapsed before he came to the cockpit, when the parts adjacent to the wound were remarkably tense, painful, and inflamed. Applied catapl. emoll. quater de die; his foot was previously washed and soaked in warm water, and the callous skin well pared. As he complained of considerable pain, an opiate was administered at bedtime. 22d. He passed a restless night, and had much pain and throbbing in the wound. On examining the part, I felt some gritty extraneous body opposed to the point of my probe. I therefore enlarged the opening, and removed two small pieces of coal. Continued catapl. emol. cum opio hora decub. 23d. His foot was more swelled, and that part on the top of it opposed to the wound became pointed, which I opened, and gave vent to
some

some purulent matter : as he was costive, I ordered him natron. vitriol. ʒiſs. et cont. catapl. cum pil. anod. h. s. s. 24th. The swelling and inflammation were considerably diminished, though his pulse was frequent, and his tongue furred.— \mathcal{R} pulv. cort. Per. ʒij quater de die sumend. 25th. The febrile symptoms increased ; he complained of racking pain in his foot, and said he felt a creeping sensation ascend from the wound to his stomach ; his heart and lungs were likewise materially affected ; respiration became difficult, and the pains of his chest so violent, that deliquium animi, attended with spasmodic twitching, took place. I bound up his arm, and took ʒxij of blood away. After this he breathed a little more freely, but still continued to faint. I prescribed $\text{spt. c. c. vol. ʒj.}$ lavend. c. ʒij. aq. menth. pip. ʒiv sacch. alb. q. s. ad gratam saporem m. capt. coch. j. pro re nata: the symptoms of tetanus began to advance with hasty strides, and the parts about the maxilla inferior became stiff ; the patient yawned very much, and deglutition was considerably impeded : \mathcal{R} opii gr. ij. statim sumend. the opiate was repeated at intervals, until he had taken gr. vj. He was put into a warm bath up to his chin, where he remained until he was faint ; after which he was wiped dry, and put to bed : he now turned sick, was seized with syncope, and vomited. I was apprehensive that some of the opium was thrown off his stomach by the vomiting. I therefore dissolved op. gr. ij. in aq. menthæ. pip. which remained on his stomach. His Majesty's ship Resolution being in company, I requested of

S 3
Capt.

Capt. Larcom, to send for Mr. Porter, the surgeon of her, that I might hold a consultation with him on this unhappy young man. He came on board, and after we had examined the wound very minutely, and observing the direction the nail had taken, we deemed it necessary to make a bold incision right in the direction of the wound, beginning between the fourth and fifth toes. I took a scalpel, and carried my incision two inches in length, quite through the substance of his foot, between the metatarsal bones: there was little hemorrhage: the divided parts were instantly brought together again; soft dressings with compresses were applied; and the whole retained with a roller: and as cold-bathing has been serviceable in the tetanic complaints of tropical climates, we were determined to try its efficacy in this instance, as we could not possibly have a better opportunity. Three or four buckets of salt water were poured over his head, after which he was put to bed quite delirious, and talking very incoherently; the tone of his voice was altered, and the maxilla inferior became exceedingly stiff; pulse frequent and vibrating, with a black fur on his tongue. A cataplasin was applied round the ankle of the affected foot, with opii \mathfrak{z} j. dissolved in it. He soon became drowsy, and slept for four hours, but when he awoke he was still very much deranged, and spoke incoherently. His drink was lemonade, and sago with port wine was given at intervals, which he swallowed with great difficulty: his stomach was so much debilitated that he frequently vomited.

26th. When I visited him in the morning, I found him perfectly sensible, and said his jaw was not so stiff as it had been. The anodyne cataplasin was repeated; his foot was easy, and free from pain, but much benumbed. He took one cup of tea with a little bread sopped in it to his breakfast; sago and wine to dinner; and had tea and lemonade to drink. I did not venture to give him an anodyne in the evening, as he seemed to be very much stupified with what he had already taken, independent of the anodyne cataplasin round his ankle, which I imagined operated very powerfully. 27th. I found him free from fever, with a gentle perspiration over his whole body, yet he had a wild frantic look, his tongue was furred and brown in the middle. He complained of great debility; for the weather was very warm, we being cruising to the Southward; and his pulse was soft and feeble. R pulv. cort. P! 5fs 3tia. q. h. s. ex. cyath. vin rubr. He now experienced little difficulty in deglutition, the stiffness of his jaw entirely vanished, and the only pain he had at present was about the praecordia, with sometimes a slight pain in his throat. I ordered some chicken broth for his dinner, but he did not relish it; his stomach was remarkably irritable, and could not retain the cortex in substance, I therefore ordered him the decoction. The pain of his side became worse, which he said was an old complaint owing to a contusion which he got five or six years ago. Appl. empl. vesicat. part. aff. and as he was constipated, an opening injection was administered in the evening.

ing, which procured him a plentiful evacuation of indurated fæces; all the symptoms of tetanus disappeared; and the fever seemed to be the only malady left to encounter with. The dressings were removed; an adhesion of the sides of the wound had taken place; there was little discharge, and the smell was not at all offensive. R Opii gr. ij. hora decub. s. 28th. He had little sleep during the night; his pulse was frequent, his tongue foul, skin hot and dry with great thirst. His stomach so irritable, that it could not retain a few spoonfulls of sago and wine. The decoct. cort. was given as often as his stomach would bear it; the pain of his side was quite removed by the blister, which discharged plentifully. 29th. He rested very little in the night; and when I visited him in the morning, I found the fever nearly as bad as it had been the preceding day. Cont. Medicam. The wound was dressed, and it wore a favorable aspect. 30th. He rested better than he had done yet; his skin was cool, pulse soft and regular, tongue moist; but he still had an aversion to any kind of food. The wound looked healthy, and the discharge was good, and in moderate quantity. The decoct. cort. wine, &c. were continued. It is worth while noticing that the decoction remained on his stomach, when the cortex in substance was sure of being ejected. In the afternoon, at two o'clock, he had a violent exacerbation of fever, and complained very much of his head. He was got out of bed in the height of his paroxysm, and had three buckets of water thrown over

over him, after which he was wiped dry, and put to bed again. This effusion of water had an excellent effect; it relieved his head, and abated the fever. An unfortunate accident happened to him in the evening, which was occasioned by a boy running against the cot, and bruising his foot against the frame; the adhesion which had taken place was tore asunder, and he lost near a pint of blood. His pulse became feeble, and his extremities cold. I gave him some wine, which did not remain five minutes on his stomach. The dressings were removed, and after cleansing his foot of the clotted blood, and finding the hemorrhage had ceased, I applied fresh dressings, with suitable compresses, and brought the edges of the wound into close contact, with the bandage passed round moderately tight. 1st May. I found him reduced to a most wretched and miserable state of debility: he refused all kinds of nourishment; and at night he became comatous, and spoke incoherently. Three days elapsed without much alteration, in the course of which time he took little food, and only had the decoct. cort. three times a-day, with some port wine. May 4th. His senses returned, and the pyrexia left him: his stomach, which had been so much enervated, began to recover its tone; he took his medicine freely, relished his wine, and expressed a wish (after mentioning several articles of food to him, and asking him if he could fancy any of them,) for some roasted fowl, which I indulged him with. The wound looked well; and I had the felicity of

seeing my patient (whose dissolution appeared to be approaching, and which fatal catastrophe I at one time hourly expected,) in a state of convalescence. He now took \mathfrak{z} ij. of the cort. quater de die: and on the 2d June, by the help of nourishing food, which he was supplied with from Capt. Larcom's and our table, his health and strength were again established.

" I cannot help observing, that since I have had the honor of serving in the royal navy, many cases have come under my care, that must inevitably have terminated fatally, and such as would have held all the medicine in the *Materia Medica* at defiance, had not that generous liberality and humanity which expand the heart of every good officer, induced them to supply the sick from their own tables, and at their own expence, dainties that could not otherwise have been procured. I am, Sir, with the most profound respect, your most obedient servant,

" RALPH CUMING,

" Surgeon of his Majesty's ship *Hind*."

" To THO. TROTTER, Esq. M. D. &c."

MEDICINA NAUTICA.

The following CIRCULAR LETTER was transmitted to most of the Surgeons within my reach ; and as it affords a general view of the nature of our inquiries, I shall give it a place here for the information of those who have not seen the original.

“ S I R,

“ **H**AVING been for some time employed in arranging materials for a second volume of my *MEDICINA NAUTICA*, I shall consider myself much favored by any communications which your experience of the subject has enabled you to collect.

“ Although an undertaking of this kind is, in many respects, new, it will not be doubted that it may be productive of considerable benefit to the public service. More than four hundred surgeons are at this moment engaged in medical practice, in different stations of the world. Among such varieties of climate, and other circumstances connected with naval operations, an attentive observer cannot fail of meeting with interesting occurrences. And as a detail of many of these may not be of sufficient

sufficient extent for a separate publication, it is presumed that the present work will serve to bring fugitive and detached remarks into a general view, and thereby record much useful matter of fact that must otherwise perish.

“ Encouraged by the approbation which has been already bestowed on our former attempts, and some valuable communications which have been entrusted to our disposal, we are induced to extend the limits of our compilation, as a repertory for *all information* that can improve nautical medicine, and add to our knowledge of preserving the health of seamen.

“ The length of the war has now afforded a wide field for observation ; and, with the experience of our predecessors before us, more correct evidence has been obtained on a variety of subjects. It has been particularly interesting to note the diseases of climate, their variation from season and other causes ; those produced in certain harbours or seas of the same country ; with remarks on the nature of the soil near unwholesome places of anchorage ; the water, fruits, &c. whether salutary or otherwise. Journals of the weather, and other meteorological remarks ; hints for improving diet, preserving provisions, cloathing, exercise, ventilation of ships, &c. These, being all connected with the preventive plan, will be carefully registered.

“ We shall also most thankfully receive from naval officers, and our medical brethren in the hospitals, any information which their observations and experience may have suggested on the above-mentioned

mentioned subjects. Other members of the profession, though unconnected with the Navy, we gladly hope, will occasionally offer their support.

“ Many surgeons who served in the West Indies during the great mortality among the seamen and soldiers, from the yellow fever, are now in England. We have obtained some valuable extracts from different journals; and we trust that others will favor us with their correspondence. What we particularly aim at is the knowledge of those necessary precautions and means of prevention, that can best secure the unseasoned European subject against this fatal endemic. From recent experience we have accumulated some interesting facts on Contagion: we shall therefore resume our subject, and continue our opposition to the *unrespirable gasses*, as correctors. It may be worth mentioning here, that very shortly after we had stood alone, in denying that any positive evidence or unequivocal testimony had yet appeared in favour of the nitrous gas, the work of an eminent American physician was reprinted in England; in which it is asserted this pseudo-prophylactic is itself the very *matter and substance* of contagion. Whatever faith is to follow the trans-atlantic doctrine, it is a melancholy proof that there is still much conjecture in our art; and which now and then makes it a *stumbling-block* to common sense. We accordingly recur to our usual method of prevention with increased confidence.

“ A part of this work will be allotted to the practice of Surgery. Some important cases and
remarks

remarks have been put into our hands, and we are promised others. The fine operation of Mr. Burd, narrated in our former volume, performed on the French officer, while his own surgeon was unable and unwilling to assist him, will remain a *confutation* of those blasphemous falsehoods which have been so industriously circulated in France against British surgeons.

“ We earnestly recommend a careful investigation of the nature and causes of that species of ulcer which has lately been so destructive in ships, and distinguished by the rapidity of its progress. The only mention of a similar occurrence which we have seen in the records of Surgery, is to be met with in Dr. Rollo’s late work on “ Diabetes.”

“ I am here induced to mention a book on Cookery, which has lately fallen into my hands, written by Mrs. Melroe, and intitled “ *Æconomical Cookery.*” It contains a variety of pleasant dishes, that will be found acceptable to both the officers and seamen at sea : and the humane surgeon will find among them many useful hints for improving the diet of his sick-berth.

“ At a crisis like that in which we are engaged, it will not be disputed, that on a continuance of the present health of our ships must, in a great measure, depend the salvation of this country. Among medical officers, therefore, a reciprocal diffusion of professional information must always
7 be

be useful ; for it becomes our duty to provide for the most desperate exigencies of service, even in the season of unexampled prosperity. But there are many incitements that make this rather an agreeable than a difficult task. We have all witnessed with satisfaction the attention which has been paid to render the situation of medical gentlemen more comfortable while employed, and to provide for their future support, beyond the example of former times. This will naturally beget a grateful return on our part ; while a faithful discharge of office, and an assiduous attachment to scientific pursuits, will entitle us to progressive encouragement. This deportment will also insure to us the lasting confidence and affection of those who are the immediate inspectors of our duty ; for surely nothing can be so acceptable to officers and a ship's company, on perilous service, in an unwholesome climate, or in the dangers of battle, as the attendance of a surgeon, who devotes a regular portion of his time to study, that he may avail his patients of every new discovery in the practice of the healing art.

“ We presume not to think, that the present is the most eligible season to render our work perfect : but we shall return to it with avidity, when peace and retirement afford us leisure for revival. In the mean time, in order to transmit it useful to our successors, what we want in ability we will endeavour to compensate by our love of the subject, and by diligence and fidelity in collecting and compiling the materials.

“ My

“ My central situation at Portsmouth will facilitate the conveyance of communications ; and all letters, *post paid*, directed to me, will be duly attended to. The habits of friendship and intimacy in which I have long lived with a number of the Surgeons on the Navy List ; the uninterrupted intercourse of these, and the harmony of opinion which has united our efforts in public service, on some arduous occasions, will be sufficient pledges to me that the present address will not be disregarded.—I am, with great respect, Sir, your most obedient humble servant,

“ T. TROTTER, M. D.

“ Physician of the Fleet.

“ P. S. It is requested that correspondents will mark their letters, &c. on the cover, “ *Medical Communications.*”

To the Surgeon

of his Majesty's ship

ERRATA IN OUR FORMER VOLUME.

Page 117. The Cape Squadron failed in so great a hurry, that no time was given to receive the fruit on board. The consequence was, that the ships were overrun with scurvy; and had the settlement not capitulated when it did, it is hard to say whether half the crews of the ships would not have perished.

ANSWER TO CORRESPONDENTS.

We beg leave to refer "*A young Officer*," to Captain Burrowes, and Mr. Leggat, surgeon of *Le Puissant*, for the information he wishes concerning the *Colossus*. *Vide* page 165 of our first volume.

"*Philo Med. Naut.*" is informed, that the Officer alluded to at the head of page 53, is Sir Edward Pellew, Bart. The "orders" were put into our hands by Capt. A. Morris, who had been first lieutenant with that great officer.

We thank "*Palinurus*" for his kind remembrance every Saturday night. We have profited by his hint; and in return heartily wish he may never meet the fate of his name-fake.

O nimium cœlo et pelago confise sereno,
Nudus in ignota, Palinure, jacebis arena!

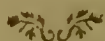
If the Officer who signs himself "L. L." whom we take to be Captain of a ship of the line, will undertake the task himself, we should be very proud to insert it in our pages. If we are to judge of his abilities from the specimen he has given, we could not wish to see it in other hands.

The communications dated "off Madeira," though valuable, cannot be admitted, there being no signature, and the ship's name is left out.

The Officer who first served cocoa to his ship's company, in lieu of oatmeal, in the West Indies, was the brave veteran Captain James Fergusson, late lieutenant-governor of Greenwich Hospital.

Much important matter, just transmitted to us, has been withheld for the present, from our desire of giving a summary of the American doctrine of contagion and marsh miasma.

In the department of surgery we wish to direct our friends to the subject of extracting splinters in wounds; and burns, from the explosions of gunpowder in time of action. The first belongs exclusively to the navy surgeon; as connected with the latter, we would recommend the perusal of "Kentish on Burns."



A P P E N D I X.

Remarks on some late Proceedings of the Legislature of the State of New-York, relative to the Removal of certain Trades and Manufactures from the thickly settled Parts of the City of New-York, in an Application of the Mitchillian Doctrine of septic Fluids to the Processes carried on in several Branches of Handicraft Business, particularly the MAKING OF SOAP AND CANDLES; being the Substance of the Argument employed at Albany in March 1797, to procure the Repeal of Part of a preceding Law (of the 10th of February 1797).

LIKE a calm observer, their counsel * said, he had beheld, on several occasions, the legislature engaged on subjects of a chemical nature. The most important of all these, the prevention of in-

* Dr. Mitchill.

DR. MITCHILL'S NOMENCLATURE.

septon †, for azote or nitrogen.

septous gas, for azotic gas, or atmospherical mephitic.

septic acid, for dephlogisticated nitrous air.

septic gas, for nitrous gas.

septous acid, for nitrous acid.

septic acid, for nitric acid.

septate, septite, for nitrate, nitrite, &c.

† σηπω, putrifacio, whence comes septon, putridum.

fectious and contagious distempers, had again and again been agitated by the representatives of the people. Regulation had succeeded to regulation, and project given way to project in such rapid succession, that he hoped before this time, by the joint efforts of those who were engaged in the reforms, a system of rules, well digested and complete in their more material parts, would have been elaborated. He was afraid, however, that a great deal was yet necessary to be done. He was also apprehensive there had been some things done, which it had been better to have left undone.

He alluded to the act passed during the present session, entitled, "An act to amend an act, entitled, "An act to prevent the introduction and spreading of infectious distempers within this state," which, as the memorials, remonstrances, and petitions presented to the legislature sufficiently express, is considered in some of its parts as bearing extremely and unnecessarily hard upon a valuable and industrious body of citizens.

The petitioners for relief from the oppression of that law, as well as himself, were inhabitants of the city of New-York. He trusted they were all guided and governed by the same desire of rendering their place of abode comfortable and wholesome. The respirable quality of the atmosphere they lived in was a matter of eminent concern to them all.

From vitiated air, had it of old been believed, that epidemic distempers derived their origin; though in the times of rudeness and superstition, it had been considered as a mark of piety to refer all visitations and calamities of this sort to the anger of the gods, or at least to the displeasure of Heaven. This short way of philosophising was in no wise calculated to satisfy the curiosity of an enlarged

larged mind. By degrees, however, after a series of observations, extended from the 400th year before the Christian æra, quite to the present day, it had become established as a settled fact, that those wide-wasting diseases, the plagues of ancient times, by which several sea-ports and country places in the United States had, within a few years, been dreadfully afflicted, were mostly connected *with a pestilential condition of the air.*

To comprehend how the wholesomeness of the atmosphere should be destroyed, either by a privation of that portion of it which ministers incessantly to the support of life, or by letting loose vapours and exhalations of a nature noxious enough to poison the animals who live and move in it, required an extent of experimental research, which all the accumulated industry of the past ages had never, until very lately, accomplished. It now was admitted on all hands, that though something of an unfriendly composition might be formed in the clouds, by the association of the particles of one kind of air with those of another, yet the principal mischief arose in the form of steam from substances *on or near the surface of the earth.*

Since then the explosion of the astrological notion of the malign aspect and influence of the stars, and other bodies above their heads, the eyes of mankind were turned downward in search of the cause of the inconvenience they endured, from some source beneath their feet. After a course of various observations and experiments, it had been discovered, that the greatest degree of vitiation which the atmosphere manifested by its operation upon the human frame, proceeded not from *earthy or metallic bodies*, but was a somewhat emitted from *certain animal and vegetable substances during putrefaction, and floating about in a volatile form.*

What the nature of these *new* aërial fluids was, had remained for a long time utterly unknown. Since, however, the dead body of an animal or plant disappeared almost entirely by exposure to wind and weather, and left but small traces of its former existence behind, doubts had been entertained concerning the vulgar notion of their return to *earth*, as they seemed rather to be resolved into *air*. The perfect transparency of such a fluid, as it reflected no light, put it out of the power of the eye to examine what it was, even when assisted by the most perfect glasses. Its yielding and impalpable nature evaded examination by feeling and handling, and eluded the nicest exercise of the sense of touch. Thus its want of visible and tangible properties had rendered an examination of its peculiar nature, for a great while, very imperfect. And even since the introduction of vessels of glass into laboratories, it had not been possible to investigate thoroughly their history in any other way *than by attending to their combinations with other bodies by means of chemical attraction*.

In attending to the changes which plants and animals underwent after death, it at an early day had become apparent that the air into which they were converted was not *always* of a hurtful kind; that some species of both classes of beings would rot without causing any mischief at all, while other individuals of either sort, while they underwent corruption, were, though not always, yet frequently noxious, and at best, of a suspicious character. Mankind, by attending to the subject in all possible ways, had discovered at last, *that some putrifying substances would afford no pestilential air at all, and others that were capable of yielding it, would only do so under certain circumstances*.

But

But before the human mind had progressed far enough to come to any definite conclusion on the subject, camps had been desolated, armies cut off, and cities depopulated by pestilence. In contemplating these distressing events, though it was obvious enough the morbid cause must have originated *locally*, or have been generated on the spot, both in the field and garrison; still, so great had been the reluctance of mankind in settled and domestic life to allow their city or place of residence to be unhealthy, that in the history of all ancient and modern plagues, a belief has almost universally prevailed of their introduction from some *foreign place*. The yellow fever of New York and the other commercial cities of America, for instance, if you might give credit to a multitude of testimony, had been always imported from some distant parts, commonly from the West Indies; the inhabitants of those islands agreed among themselves in disclaiming its origin there, but differed whether it was of Asiatic descent, from the climate of Siam, or of African production in the latitudes of Guinea. Had the Malays or the Negroes the custom of reading our performances, and writing books of their own, they would doubtless feel an equal desire to wipe away these aspersions, and contrive stories as plausible as many of ours, to countenance its introduction by some infected traveller from Ethiopia, or sickly sailor from the Philippine Islands. In like manner, the Athenians of old, though surrounded on the land side by their Peloponnesian foes, and grievously incommoded on a thousand accounts, as they were cooped up within their citadel and walls, flattered themselves the plague they suffered was imported into their harbour from Egypt. A late sensible

traveller had observed that it never arises in Cairo spontaneously, and affirms it is always introduced from Constantinople. The people of this Turkish capital comfort themselves it did not spring up originally there, but was brought from the northward by certain foggy or unwholesome winds that had blown across the morasses in the neighbourhood of the Euxine. These prejudices, which had been fostered and cherished in most sea-port towns, by the spirit of commerce, were at this hour happily wearing away. It redounded inexpressibly to the honour of Americans to be the first to cast them off. Those pestilential outcasts, whom nobody would own, but whom every body sent as vagrants and vagabonds from country to country, were beginning to obtain an acknowledged and legal settlement. They were the monstrous offspring of our vices. Deformed and hideous as they were, the parentage and filiation was ours; and as we begat them, we should not refuse to own them. If the reports which, until a few years, had invariably prevailed, were traced, there could not be found a spot or corner of the civilized globe, which gave birth to them. If, on the other hand, attention was given to facts, there was not a city or town in the United States, whether sea-port or mid-land, nor a house or habitation in either, wherein pestilential diseases might not arise. The truth is, *they might and did arise in most places where corruption and nastiness abounded, and of course were generally not of foreign derivation, but of domestic origin.*

Thus pestilential vapours might be produced from some of the bodies of plants and animals, or some parts of them, undergoing disorganization, on the surface of the earth, which being made

volatile under certain circumstances, so contaminated the atmosphere as to cause endemic and epidemic distempers.

He remarked, that this offspring of putrefaction, though too attenuated to affect the sight, or the touch, was attracted by other bodies. This was particularly the case with respect to the *ashes* afforded by wood burned upon the hearths of dwelling-houses, and by the *plaster* which constituted their walls. Long ago had it been known, that the scraping of the matters collected near doors, in ditches, yards, outhouses, and stables, as well as the decayed walls and old rubbish of dwelling-houses, were exceedingly useful in the fabrication of saltpetre. This was so well known and understood, that under the administration of the late kingdom of France, the manufacturers of the article were not only incorporated in the city of Paris by their sovereign, but were allowed to take away from demolished buildings as much of the old mortar as they pleased, to encourage the domestic production. And notwithstanding the fuel of that vast city was chiefly wood, such had been the accumulation of putrid vapours in the saltpetre beds, that the Academy of Sciences, who had directed to examine and report on the subject, had recommended the mingling of imported pot-ash with the crude materials, as a means of procuring saltpetre in the most expeditious way, and in the most abundant quantity*.

In

* From Masséy's Treatise.—“The common peasants in France and Germany, who are almost all saltpetre-makers, scrape together the muck and offals of their farm-yards, and throwing them under open sheds, suffer them to lie till they find they will answer their end. Though they know
“ little

In these alliances then, which *putrid* vapours form with alkaline salt and calcarious earth, they had been subjected to the most rigorous examination, and analyzed with scrutinising exactness. It had accordingly been proved, by trials made on the effluvia steaming directly from corrupting substances, that they were arrested by chalk * and soda, as well as by the substances enumerated; and thus he concluded the *observations of housekeepers corroborated the experiments of philosophers, and both received confirmation from the processes of the saltpetre-makers.*

The sum of the testimony from these three sources was, that *pot-ash* and *lime* saturated or neutralised the *putrid exhalations* they attracted; that being both of them of alkaline nature, they shewed by their analysis, the material they had drawn from the air was of an *acid quality*; and that this acid,

“ little of the use of putrefaction, they take care to promote
 “ this process, by drenching them with urine or muck-water,
 “ and frequently turning them over; by which means they
 “ are brought to maturity much sooner than the larger
 “ nitre-beds. These materials, with the *wood-ashes* their
 “ *hearths supply*, (if the latter are not added before,) are
 “ thrown into a large tub, and water is poured upon them,
 “ which runs out through a hole stuffed with straw at the
 “ bottom of the vessel. Thus simply do they procure their
 “ leys, in the boiling of which their women and children are
 “ chiefly employed. Thus this business is harmless and
 “ healthy, because the pot-ash keeps down the septic acid,
 “ which would otherwise rise in vapour, and infect the air.”

* From Chaptal's Chemistry.—“ Twenty-five pounds of
 “ chalk, well washed in warm water, and exposed to the
 “ exhalation of bullock's blood in putrefaction during eleven
 “ months, afforded nine ounces of the nitrate (septeate) of
 “ lime, in a dried state; and three ounces one gross of
 “ crystals of nitrate (septeate) of pot-ash, or common nitre.”
 Evincing the precise and noxious nature of this effluvia.

which,

which, with the saline ground, formed common nitre, and, with the earthy basis, constituted calcareous nitre, was *the acid of putrefaction* *.

As far as the almost innumerable mass of facts on these and similar subjects had been stripped of foreign and adventitious circumstances, and generalized in a scientific and logical manner, there existed the most cogent evidence, that the production just named, and some of its modifications, formed the pestilential poison; that under the medical names of *human effluvia* and *marsh miasmata*, and he scarcely knew how many other titles, was commonly called in popular phrase, *infection* or *contagion*; the operation of which occasioned such mortality and terror among the people, and which the Legislature had with such laudable solicitude been engaged in guarding against.

He had judged it the more necessary to bring forward to notice, the facts tending to shew the exact and precise nature of pestilential fumes: because through the whole course of his reading and conversation, they appeared to be considered as unknown combinations of elementary atoms, equally unknown; mysterious and inexplicable things engendered from the chaos of organic dissolution;

* From Fourcroy's "Philosophy of Chemistry."—"Nitric acid, liquid, white, caustic, of a strong nauseous smell, formed of azote (septon) and oxygene, inflaming sulphur, charcoal, zinc, tin, and oils, yielding to combustible bodies, various portions of oxygene, and thus giving birth to nitrous acid, nitrous gas, or nitrous oxyd, destroying colours, burning and turning yellow, vegetable and animal substances, converting them into acids, decomposing ammoniac, PRODUCED BY PUTREFYING ANIMAL MATTER, forming nitrates with *earths* and *alkalis*, remaining slightly united with metallic oxyds, and tending to acidify them. Nitric (septic) acid, to the production of which it is well known how much *animal substances* contribute, in artificial nitre-pits, arises from the union of oxygene with azote (septon)."

productions so equivocal, it was hard to know what to call them; surpassing, as some believed, all mortal comprehension, and lying far beyond the limits of human understanding.

If his attempt to state what it was had been successful, then might we be considered as having caught nature in her work-shop, examined her collection of raw materials, and discovered which of them she employed in this fearful manufacture, which, like the *poisoned shirt of Hercules*, enwraps the wearer too closely to be shaken off. Then both the philosopher and the statesman would have clews to guide them through the labyrinths of science and legislation.

From whatever substance, therefore, *the acid of putrefaction* was produced, it would be killed in the egg by *lime* * and *alkalis*, if they are present. They could

* From Buillon's "Means of procuring Saltpetre," &c. — "The *nitrous* (he means the *nitric*) acid is generated in the atmosphere by the help of the azote, or vitiated air, which is disengaged from animal or vegetable substances, when in a state of putrefaction. If, therefore, instead of throwing sand on the ground in stables, &c. and building or plaistering their walls with fat earth or clay, the ground were to be covered with marle, or calcareous stone, and the walls within and without plaistered with the same, beat and tempered with water, in the form of mortar, in five or six months time the ground and also the plaister of the walls would be found sufficiently changed with saltpetre to be lixiviated with advantage." — "By following the course of Nature, it is possible to establish artificial nitre-beds: it is only necessary to build walls of calcareous stone, and, instead of mortar, to make use of calcareous marle, tempered with water: these walls should be plaistered over with the same kind of mortar, to the thickness of about two or three inches. If the walls are built in the neighbourhood of dung-hills, or other heaps of filth, they will generate saltpetre so quickly, that they may be lixiviated twice a year." — The substances

could quell, subdue, overpower it. They were the ichneumons which destroyed the unhatched and yet harmless crocodile. If they were not at hand, the new-born monster, fostered and nurtured by heat, acquired the fury of a dragon, soon took wing, and flew about the land.

It might, perhaps, be thought a digression from the subject under discussion, if he dwelt at large upon the trades, occupations, and employments, wherein sickly exhalations are generated. *Rammazzini* had written well on this subject before him. Instead, therefore, of going the round of a particular enumeration, he should just observe that this septic poison might be considered as experimentally proved to exist in city and in country, in the houses where domestic animals, both birds and quadrupeds, were kept, and discharged their dung and urine; in privies and the receptacles of human ordure; in grave-yards, and the earth surrounding the buried bodies of men; in clothing, bedding, and furniture, impregnated with secreted matter and perspiration; in the corrupted blood and offal of beasts slain for the market; in the skinny and lean parts of animals, particularly rotten hides, beef, and fish; in putrefied wheat, coffee, cabbages, and certain other vegetable substances; and in that mixture of these and other dangerous materials, which formed the evaporating foulness of the New-York streets, and the dismal collection' along the river-side.

This *pestilent acid* is most easily dissolved in water. Travelling in company with this guide,

stances he mentions as affording nitrous acid, are "*the filth of cities, such as the contents of necessary-houses, the refuse of slaughter-houses, the sweepings of the streets, dead animals of all sorts, &c.*"

it gradually soaked through the earth on which cities were built, insinuated itself into the recesses, whither this all-pervading fluid found its way, and took up its abode or gained admittance into cisterns, wells, and fountains. Even here its alkaline foes attacked and seized it. They grappled with it, and held it fast, until the contending champions could be brought up to day-light, and viewed as they lay clenched in close encounter. After the conflict and effervescence which always attended their meeting was over, the two friends for a while were commonly victorious; but exhausted and overpowered at length, their salutary efforts were but of little avail, and poison predominated in the reservoirs*.

To an observing mind, the history of man presented an abundance of similar truths. He presumed almost every person had learned from the newspapers a description of the dungeon of Olmutz, where the unfortunate La Fayette lingered in captivity. The victim of a vindictive policy, he there received little consolation from human friendship. Still he was not without a friend. The *lime* which cemented the stones of his dismal apartment, attracted the deadly vapours which threatened his

* From Bergman's "Analysis of Waters."—"SNOW-WATER contains a small quantity of salited lime, together with some slight vestiges of *nitrous acid*, &c." "RAIN-WATER is generally contaminated with the *same substances* as the former, but in GREATER QUANTITY, &c." "WELL-WATER, besides a large quantity of the above-mentioned substances, often afford GYPSUM and NITRE." "LAKE-WATERS are less clear than any of the former, &c. they sometimes contain all the substances above recited; and, besides, are generally vitiated by an ANIMAL OR VEGETABLE EXTRACT." "MARSH-WATERS have less motion, and therefore are less clear, more heavy, and more VITIATED by EXTRACTIVE MATTER, &c."

life, and formed with them the *nitrous efflorescence*, which crept along the walls.

The bills of mortality shewed that large and crowded cities were unfriendly to the rearing of children to manhood. Was it wonderful? The infant inhaled pestilence with the air which first expanded his little lungs, absorbed it at every pore, swallowed it with the tainted milk of the mother's breast. The water which slaked his thirst, and the food that supported his strength, were contaminated with the same mischievous ingredient. And this operating in so many ways upon his tender frame, brought it to a premature dissolution, unless it should be hardy enough to become seasoned by degrees to the poison, and grow insensible of its effects. What happened to the child, happened also to the parents. The air, the earth, the water; food, clothing, bedding; all became more or less tinctured with *septic matter*, produced in a great degree from substances collected by their own hands, employed with the most perverse of possible industry, in *forming the tissue of this domestic manufacture*.

The *Soap-Makers* and *Tallow-Chandlers* of the city of New-York, were considered by the bill, which had been passed during the present sessions, as contributing largely to the mass of pestilential vapours. These useful citizens considered themselves aggrieved by the judgment the legislature had passed upon the business they followed. They felt a confidence the effluvia from their manufactories did not impair the health, far less destroy the lives of their fellow-citizens. If the occupation did, like THE UPAS-TREE, spread around the spot where soap and candles are made, desolation and death, they would not only submit to the imputation and its inconveniences without a murmur, but

but in a public-spirited manner, would applaud the justice of the statute.

He should examine the subject in two ways. First, upon its principles: and secondly, upon its actual operation: and he had little doubt it would appear upon discussion, to be a harmless occupation *generally*, and even capable sometimes of counter-acting the effects of contagious and infectious vapours.

From the facts heretofore adduced, he believed there would be little need of stating additional evidence to prove that *lime* and *potash* were constantly engaged in baffling the powers of pestilence, and fighting the battles of health. Those articles formed a large part of the materials with which the manufacturers alluded to carry on their business. It would be a most remarkable discovery, that a law of nature, which acts uniformly in other instances, in making these exhalations submit to alkaline dominion, should fail to operate, or should suspend its efficacy as to this. But there was no such irregularity known to exist. The septic acid fumes which infected the air of the inland country, oftentimes as much as of sea-ports, and made, in proportion to numbers, as great havoc in interior towns as in any place whatever, yielded to the coercion of *potash* around the leech-tubs of Cobus's kill, as well as in the soap-works in our capital. Nor was the *lime*, which was always employed to give sharpness to the ley, inactive in other respects. So far from remaining idle, it had no sooner whetted the weapons of its ally, than it prepared to attack, though with feeblér powers, the common enemy both of themselves and of mankind. He might appeal to the knowledge which many of the members of the legislature had of the method of managing potash works, whether ever a pestilential distemper

distemper was generated there? There was no such thing known. The dæmon of pestilence would be instantly arrested on shewing his face there, and so closely confined and guarded, that he never could escape and prowl about for human prey any more. The lixiviation of ashes then, and the extraction of its alkali, seemed to be excused on every consideration, from having any agency in this *destructive work both in town and country*.

Here, however, it had been alleged, that the *fat* which constitutes the other part of the soap, and the whole of some sorts of candles, putrefied and emitted exhalations of a quality so deleterious, that a wise policy should prohibit the carrying on the processes, for which the oily parts of animals were collected, and by which these alarming vapours were supposed to be extricated. If this charge could be supported, then indeed ought the law to be carried forthwith into execution. But he did not know any *facts* which countenanced such an opinion. The true interpretation of them led to an opposite conclusion. He then proceeded to examine them.

The distillation of animal fat in close vessels, saving the sebæic acid, gave no volatile salt at all; far less any fluid possessing the qualities complained of. Its constitution was such, that the peculiar ingredient which became the basis of noxious airs, and without which the truly pestilential compositions could not be formed, resided not in it. Hence, though it might become rancid and smell disagreeably, the effluvium was not poisonous. From the nature of the material, every housewife knew, that though the *fat* might smell as bad as the *lean*, it did not turn to rottenness in the same manner.

Again, repeated observation had assured us, that on the escape of the noxious ingredient from animal substances decaying in large heaps, as happened in the public burial ground of the city of Paris a few years ago, the residuary portion turned to lumps of *fat*, almost as firm as spermaceti. This fact was so well established, that economical projects had been formed to decompose the carcasses of animals under water, in such a manner, that while the pestilential matter inherent in the blood, skin, brawn, and muscles, gradually escaped into the water, the residue of the lean parts turned to fat. Need he dwell upon the statement of other facts of this sort, which the periodical publications of Europe for several years past, have announced to the world so often?

Further, it was in the power of art to imitate these processes of nature. The operation was as easy as almost any in chemistry, by driving off the specific portion, whence pestilential air was generated, to convert a bit of the leanest beef into fat or tallow. During the continuance of life, the harmless atoms, which by their binary union, constitute fat, restrained the disorganizing efforts of their partner; but when the partnership among the ingredients of a muscle was dissolved by death of the animal to whom it had belonged, pestilence sallied forth, free from restraint, and disclaimed his *gracely* connection. It was to the gentle, but firm operation of this very fat, so much complained of, or of the elements from which it might be formed, that the pestilential matter of our bodies is in a good degree held in bondage during life, and prevented from exercising those destructive powers upon its own constitution, which, on its enlargement, act with deadly malignity upon others. The whole of the phenomena of the composition of living

living muscles, and the decomposition of dead ones, held forth this truth, *that neither oily substances, nor the materials of them, contained pestilential poison, or its essential ingredients.*

Besides, New-York afforded monuments enough of the efficacy of oil, even under the disadvantageous form of mixture with metallic bodies into paint, to evince its power of arresting infectious vapours. Look at them (continued he) in their filthy birth-places, the bottoms of the ships and blocks. See them aim at the timber of the vessels, that at low-water are grounded there in the mud. Behold the oil quit its union with the white-lead with which it had been mixed, and turn black by destroying the acid, which was endeavouring to eat through to the planks. View these pestilential teams as they rise and exert their destructive effects upon the neighbouring houses. Direct your eyes to the blackened sign-boards, where the oil has so long withstood their assaults *, that scarcely a letter of the inhabitant's name is legible. Enter the rooms, and see the vapours, which the oil has so firmly resisted, thicken, destroy the birds in their cages, and doom their owners to the grave. He added, that these facts, which were as public as the market, and obtruded themselves upon the no-

* From Chaptal's Chemistry.—“The action of the nitric (septic) acid on most *inflammable* matters consists in nothing more than a *continual decomposition* of this acid.”—“The nitric (septic) acid, when mixed with oils, renders them thick and *black*, converts them into charcoal, or inflames them, according as the acid is more or less concentrated, or in greater or less quantity.”—“The facility with which this acid is decomposed renders it one of the *most active*, because the action of acids upon most bodies is in consequence of their own proper decomposition.” **THUS OILY SUBSTANCES DECOMPOUND THE MATTER OF INFECTION.**

tice of every passenger, would, if fairly interpreted, bear witness to the solidity of his argument.

Once more: it was well known that several acids, and particularly the *acid of putrefaction*, was decomposed very readily by *fat* and *greasy* bodies, and that so rapidly, as, with many sorts of oils, to burst into flame. This capacity of acids to combine with animal fats was so well understood, that *acid soaps* had been manufactured. But the experience of mankind had long ago shewn, that they were unfit for rendering substances clean. They had accordingly been discarded from the arts, through practical conviction, not theoretical opinion. Could a soap, he asked, compounded of fat and a pestilential acid, neutralize and remove infection from tainted clothes? What but an alkali could drag it from its retreat, entangled as it was with the woof, and intertwisted as it were with the filaments of the cloth? It was the ultimate and irrefragable proof of a principle, when inferences and deductions from it coincided with common sense and the experience of ages. The true reason why alkalis are preferred as the bases of soaps was, that they deterged the excreted matters which stick to our garments, whose acidity, when accumulated and concentrated by extreme frowziness and long lying or wearing, first *reduced the fabric to rottenness and rags, and then turned to pestilence*. He thought the history of prisons afforded ample confirmation of this conclusion.

These considerations led to the conviction that *oils* and *fats* were *not* capable, from their composition and nature, to afford pestilential air; that they either neutralized or decomposed acids, and *thereby weakened or deadened the power of contagion*.

Lime, potash, and fat, thus were antidotes to contagion, in *their distinct and separate forms*. The cleanliness and health attendant on the *combination of them into soap* was so evident to every body, that there was no need of offering a word on that part of the subject. Though he could not pass it over, without remarking, that it was a very curious and singular event in the annals of legislation, that a manufacture, whose ingredients, whether considered separately or in composition, were labouring with an effect, which almost exceeded calculation, to diminish the causes, and frequency and violence of epidemic fevers, should, in the present state of science, and near the close of the eighteenth century, and in an American republic too, be treated by a legislature *as an internal hot-bed of infection!*

He proceeded, in the second place, to inquire whether the reasoning he had used was bottomed on experience? In order to determine this, he exhibited a few examples to shew that men might deal in oil and fat in all their forms, both vegetable and animal, externally and internally, without being subject to plague, yellow-fever, or any distemper that resembles them.

He said, the *whale-fishery* afforded instructive evidence to this point. That industrious and enterprising body of people who sent from Nantucket vessels and seamen to make war on the inhabitants of the ocean, knew that the effluvium of animal oil was not pernicious. They found their huge prey in all latitudes between the region where Disko borders upon the arctic circle, and that where, in the opposite hemisphere, Georgia, the extreme of habitable land, stretches toward the south pole; and in all longitudes betwixt the tract of Eastern Ocean which separates Madagascar from the African coast, westward to the parallel where

Juan Fernandez rises above the waves of the Pacific. Through this extensive range the whalers took on board their blubber, and either subjected it during the voyage to the operation of fire, whereby it might be separated from the skin and membranes, or brought it home barrelled up in large junks, to be tried or melted in their houses on shore. Such a vessel was filled with the exhalations of oil, putrefying in the casks and smoking from the boilers. The men, their clothing, the oars of their boats, yea the deck they tread upon, seemed to be penetrated through and through with them. Yet, strange as it might appear, these voyages were among the most healthy which are performed. It was a rare thing to lose a man during a run of eighteen months or two years, by sickness. However common distempers might be in the navy, in the transport, and in the merchant-service, there was no instance known of a putrid or malignant fever caused by stinking oil or its vapours, sweeping off the crew of a whaler.

He observed that *the customs of the Caffrarians*, nasty and disgusting as they were, afforded, among many other instructive particulars, an example of the harmlessness of *fat and oil*. The rank and horrible grease with which they besmeared their bodies, never excited fevers nor pestilential distempers. On considering the poisonous atmosphere of Java, which the young civilized Hotentot, mentioned by Rousseau, had been accustomed to breathe, our wonder at his determination to rejoin his countrymen at the Cape of Good Hope ought almost to turn to a sentiment of approbation, when we reflect, that as he had long lived with his naked skin exposed to the corroding vapours of Batavia, he longed to be once more a member of a society, whose customs would permit him

him to shield himself from pestilence by unction with grease.

The Jewish rites, which were detailed with so much minuteness in the book of Leviticus, were quoted as perfectly conformable to the principle under consideration. Their *sin-offering of ignorance* was made by taking “all the fat of a bullock, the fat that covereth the inwards, and all the fat that is upon the inwards, and the two kidneys, and the fat that is upon them, which is by the flanks and the cawl above the liver;” this was ordered to be burned by the priest upon the altar, and might be done amidst the people: but the skin of the bullock and all his flesh, with his head, and with his legs, and his inwards, and his dung, even *the whole bullock* shall he carry forth WITHOUT THE CAMP, into a clean place, WHERE THE ASHES ARE POURED OUT; and burn him on the wood with fire; WHERE THE ASHES ARE POURED OUT, there shall he be burnt.” Such were the regulations of MOSES for atonement of the *sin of ignorance in priests*; and with variations of *young bullocks, kids of the goats, and lambs*, was conducted in much the same manner for the same sin in the *congregation, the rulers, and the people*. He knew not of any mention of pestilential diseases caused by the effluvia of *burning fat*, in any of these and other numerous sacrifices of this peculiar people, though it was probable the inconveniences arising from the consumption of the other parts at or near the altar might have brought the Jews to the *practice of carrying them among the ashes without the camp*. Had the fumes from the fat been of a destructive nature, the priests must have soon expired beside the victims. It was not probable that under a theocracy, where the ministers of religion were held in such

high reverence, a duty would have been assigned them, the performance of which was unavoidably attended with the inhalation of noxious and deadly air. So far from it was the practice reckoned, that it was called "a sweet favour." He believed it would be sound policy to let the manufacturers of soap and candles remain where they are; and while they were happy in offering *peace-offerings* and trespass-offerings with their fat, and labouring to purify and illuminate the city, the RULERS might order what processes upon the *other* parts of animals the PEOPLE should carry on WITHOUT THE CAMP.

The fumes of animal oils were thus (he continued) harmless in their operation, while they were putrefying, boiling in kettles, and burning in the open fire; and so were the *fats* themselves, when in either their mild or rancid state, they were daubed upon the human skin.

Nor were their effects less remarkable when considered as articles of diet. There was an ancient story, that the gift of the olive was judged more beneficial to mankind, than that of the horse. The oily product of this vegetable and of several others entered very largely into the food of the southern nations. The Esquimaux of the North regaled himself, when hungry, with a draught of the oil of a sea-dog or a whale, and this without detriment, even when it was in a most rank and offensive state. These examples might suffice to give an idea of the operation of fatty and oily substances upon the stomach and bowels. He must omit the regular dietetic consideration of them, as such a discussion would lead him too far from his purpose.

Yet it had been urged, after all this, that if these manufactures were not pestilential, they were intolerable

intolerable *nuisances*; that they generated *impure* air, and ought to be turned out of town.

It was true, he allowed, that in the sense of the word *nuisance*, as a term at common law, these manufactures might be so badly conducted as to degenerate to *nuisances*. This had been frequently the case in England, and indictments had been brought and proved against them. But the application of this term, and the meaning commonly annexed to it, showed that there must be something capable of being *seen* or *smelled*, or *both*, in the air, according to common acceptance, to proceed upon in a complaint of nuisance. If the *eyes* and the *nose* were not offended by *smoke* and *stench*, then it was generally believed that things go on well enough. He believed there were few or no instances of indictments found, where the transparency of the air was complete, and where the nostrils were not saluted by bad odours. Yet so the thing was; and it was of great importance to be understood, *that an effluviu[m] of a most fetid nature might exist, without a particle of infection*: and, on the other hand, as the history of most epidemics evinced, *an exceedingly virulent and destructive condition of the atmosphere did exist, with scarcely any sensible qualities at all*. The former were the *nuisances* which had usually been contemplated in common law: the latter, in which the interests of society were infinitely more concerned, had been passed over as of no moment whatever. He wished this matter was understood by grand juries. It would be their duty to present a *pestilential state of the air, however free from opacity and odour*, as the greatest of *nuisances*, and find bills against all places and things which produced it. This probably would never happen until they should be convinced that though a pestilence might be accompanied

accidentally with haze or stench, yet its most formidable effects were felt when neither the *sight* nor the *smell* gave any evidence of its presence. It went about unseen, and approached like a thief in the night. It was, however, within the jurisdiction of our Courts, and ought to be treated with the rigor of stern justice. Then should we not be "afraid for the pestilence that walketh in darkness, nor for the destruction that awaiteth at noon-day."

If still, while the great sources of mischief and misery were left unregarded, a few manufacturers and tradesmen must be selected from the rest, and offered up as a sacrifice to such indiscriminating policy, why proscribe them by statute? If their occupations are nuisances, they must be either of a *public* or of a *private* nature. On proof of their being public *nuisances*, the common law provides that the sheriff may enter with his posse comitatus, and abate them. If an individual offend by erecting or continuing a *private nuisance*, the aggrieved neighbour has his remedy in a civil action for the recovery of damages. By this innovation, the trial of fact, nuisance or no nuisance, by a jury of the vicinage, was taken away, and a new tribunal instituted to decide upon the rights, properties, and privileges of freemen. The citizens asked if this were done in the spirit of deliberate and careful legislation? They were importunate to know what deep researches their representatives had made in these inquiries beyond the magistrates of the cities of Europe and the philosophers of both hemispheres?

All this, it would be said, was true in theory, but not capable of being reduced to practice. On complaints made, grand juries were slow in finding bills, and traverse juries reluctant to bring in a verdict to their neighbour's detriment; that, however

ever true the doctrine was in the abstract, there was vast difficulty, often an impossibility, of carrying the principle into effect. Therefore there grew a necessity to adopt some other mode of managing these matters. In short, jurors, it was alleged, would not do their duty, and some other persons must be got who would. Suppose jurors as delinquent as they are stated to be, and that *Commissioners of Nuisances* have in some instances their use, there was no need of them in the present case. It had been proved already, and there were certificates and opinions enough besides, if there was any need of them, to satisfy every mind, that the manufacture of soap and candles might be carried on in the city without endangering the health of the people. And as to the offensive and suspicious part of their business, these tradesmen would voluntarily, without murmuring, and without public expence, render their *crude tallow and butcher's fat*, in some remote place, where nobody would be annoyed by the vapours they emit.

He was aware it had been alleged, the vapours these substances emit rendered the air *impure*; and processes affording *impure* air ought to be prohibited, lest the health of the citizens be injured by it. The meaning of this word, (one of the words of the act,) he said, was so vague and general, that it was hard to find out its particular application. It might signify air loaded with *smoke* or *dust*, or any thing which spoils its clearness, and mingles with it foreign matter. These, indeed, rendered the atmosphere *sooty* and *dirty*. It might be interpreted to express the exhaustion of the respirable part of the atmospherical mass, *the empyreal or pure air*, and consequently leaving the residue deprived of its vital portion; and in this sense of the word, the burning of all fuel, the calcining of metals, the
formation

formation of vinegar and all acids, were processes exceedingly productive of *impure air* : or it might intend that *odorous* bodies made air *impure* by diffusion of their particles abroad, and then camphor and tallow, ambergris and rotten eggs, the rose and the tan-vat, the tar-pot and the solutions of sulphur and phosphorus, all contributed to the *impurity* of the air. Or it might mean, lastly, that something of a destructive nature, not to be smelled or seen, was diffused through the air, and rendered it *impure* ; then the formation of *fixed air*, *antmoniacal air*, *inflammable air*, *phlogisticated air*, *dephlogisticated nitrous air*, and *septic acid air*, and of every other sort of air, except empyreal air, was a process, whereby *impure*, that is, *non-respirable air*, is evolved. Each of these aerial productions was constantly mingled, in a greater or less quantity, with the common atmosphere, especially that of cities ; and every one of them, in its pure and unmixed state, was either directly noxious, or at best possessed no life-exciting power.

The truth was, that *vital air* in its *pure form*, was found by sufficient experiments to be too keen and stimulant for the purposes of health and longevity. To guard against this exhausting effect of an atmosphere *too pure*, the Author of Nature had tempered it so, that to about one fourth of air of a vivifying quality, there were added three fourths of an air possessing no properties of a kind adapted to regenerate the pulmonic blood, and keep the heart in motion. *Three fourths* of the air we are obliged always to breathe was *impure* already, and mankind lived the longer for it. Less than *one fourth* of vital air would answer the purposes of life very well. When the *purity* of air was talked of then, if it meant mere and undiluted vital air, it meant a condition of things inconsistent with the natural constitution
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of this world; if it meant the ordinary atmospheric mixture, then it meant that salubrious state of it, wherein three quarters were already *phlogisticated* or *foul*.

Thus considerably less, he concluded, than a quarter part of *pure* air in the atmosphere would answer the wants of animals. There were only certain processes in nature and the arts, and they were very well understood, which destroyed the respirability of the atmosphere. There were a thousand things of the volatile and odorous kind, which, though diffused through the air, and thickly too, seemed not to lessen its respirability in the least, or in any measurable degree, nor to possess any thing hurtful. There were other things of a volatile, though not odorous nature, that might do vast mischief by inducing fevers, without rendering the atmosphere unfit for breathing; and some that might at once possess qualities directly deleterious to man, and destructive to vital air. The *septic acid exhalations*, rising from certain putrefying bodies, were of this latter kind. Though their pestilent qualities were so dismally known by their effects, yet as their transparency, tenuity, and want of obviously sensible properties, rendered it difficult to catch and analyze them, so they have scarcely ever been taken into the account, in estimating the *impurity of air* *. To make language
precise,

* Nitrous gas and *smoking nitrous acid* are both of them, in the forms in which we see and handle them, artificial productions. They can preserve their form and constitution in close vessels only. So great is their attraction for the principle of acidity, that they decompose vital air with great rapidity, whenever they meet with it, attracting to themselves its oxygen, and setting loose its caloric or matter of heat. From the greediness with which they absorb the
base

precise, that constitution of the atmosphere which brings on plagues and other distempers of a similar nature,

base of pure air, they very soon become highly oxygenated, and turn to *septic acid* or *septic acid vapour*, pale, colourless, and in its sparse or dilute form, affecting the smell in a very small degree, or not at all. Availing themselves of this tendency of *nitrous gas*, to become *septic acid* on its union with oxygen, the Chemists have invented the *Eudiometer*, an instrument calculated to measure what proportion of vital air is destroyed by a given quantity of nitrous gas mixed with it. *The process going on in the eudiometer is the very one by which infected air is formed*; and nothing but an additional quantity of it is wanting to contaminate the air of the experimenter's chamber, and make him sick or kill him. If now the *matter of pestilence*, or *volatile septic acid*, already exist in the atmosphere, and constitute a portion of the air taken into the eudiometer for trial, in sickly seasons, it is impossible that nitrous gas should enable us to detect it there. Pestilential air is nitrous gas saturated with oxygen, and volatalized by heat; that is to say, the same sort of fluid which is produced in the eudiometrical experiment; and as nitrous gas only measures the quantity of oxygen air decomposed, pestilential air will remain untouched and unchanged by it, seeming to lie quite beyond its reach. Hence we may understand why, upon principle, the eudiometer should be incapable of ascertaining a pestilential condition of the atmosphere, or giving any notices about it; and wherefore in practice experiments with that instrument have never advanced our knowledge or enlarged our ideas on this point. The difficulty which has attended the inquiry into the true history of the fluids which have azote (septon) for their basis, seems to have arisen thus: A parcel of salpêtre was taken and decomposed by a stronger acid in a close vessel: an acid called thence the *nitrous*, came over into the receiver, and separated itself into two portions, a quantity of oxygene gas, which was suffered to escape, and a portion of smoking acid, which was condensed and stopped up for use. Its production thus was *artificial*, and it was always kept bottled up in a forced and unnatural manner. All this time, so strong was its attraction for oxygen, that the greatest care was necessary to prevent, by the closest stoppers, any communication between them. From this smoking acid the nitrous gas for experiments was usually obtained; a production more artificial than

nature, ought to be designated by the term "pestilential," rather than "impure."

He did not pretend to doubt that the legislature might wholly forbid and prohibit particular manufactures. Consequently they might limit, modify, and direct the method of carrying them on. The power of regulating trades and mechanic arts, among other things, unquestionably resided with these representatives of the sovereignty of the people; but, he believed, it was equally clear, that though the legislature possessed this power, they were under a high and solemn obligation to employ *discretion* in the use of it. It was a great misfortune when legislatures meddled with what they

than the former, and incapable of existing so long a time in the open air. Now it is remarkable, that the attention of philosophers has in a great degree been directed to these *artificial productions*, while the *natural compounds of septon and oxygene* have received but a moderate share of attention.

These natural compounds are *septic oxyd* and *septic acid*; the former of which *always*, and the latter *very often*, exists in an aerial or volatile form. These are capable of maintaining their condition unaltered, under all modifications of the atmosphere. Their production, their abundance, their activity, their relations to other bodies, their decomposition, occupy an ample space in the field of philosophy; the surveying and cultivating of which will afford employment for a great number of hands. Their attractions and affinities ought to be watched with the utmost care; and although the endiometer may not be adapted to direct our views in these respects, there are many other aids of which the diligent observer may avail himself. The exploring of this region, by following the footsteps of Nature, must be allowed to be the most safe and sure. Very many who have engaged in the undertaking have been careless, and gone so far astray, that their performances contain but a small amount of valuable information. If they will leave alone *their smoking nitrous acid and nitrous gas*, and attend to the history of the *septic oxyd and acid*, they will proceed in natural order and method, and make vastly greater progress.

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had better let alone. It lessened respect for the laws, and disposed the citizens to neglect or break them. The spirit of a free government made a voluminous statute-book necessary. A complicated mass of laws was one of the consequences of complete civil liberty. Where little or nothing was left to the *will* of individuals, *legal* provisions must be very minute, and extend to the detail of things. On no pretence whatever then, should the code be swelled needlessly, or laws enacted upon wrong principles.

There was proof before the legislature of the labourers at manufactories of soap and candles, having a remarkable exemption from the plague of Philadelphia in 1793. The same sort of evidence was afforded by three several manufactories of similar articles within the limits of the plagues of New-York, in 1795 and 1796. It had been remarked with surprize, and talked of as an unaccountable thing in Great Britain and Ireland, that during the rage of epidemic fevers, the people who followed these branches of business generally escaped, and oftentimes many of their neighbours also. Accordingly the police of the best-regulated cities of Europe, had not treated these manufacturers as stirrers up of pestilence in their municipal regulations. He thought it might be collected from the relations of travellers, that the pestilential distempers in some parts of the Turkish dominions were connected with a scanty supply or total want of soap. The detection of the composition and nature of pestilential vapours had explained these facts, and furnished a principle which cleared up the doubt and mystery of the whole subject *.

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* The eye of an observer frequently meets with facts which illustrate and confirm this principle. In Mr. Gaïne's almanac

He called upon those whom it concerned, to see now what had been done. Notwithstanding all this testimony, the legislature had pronounced against these artists, and forbidden their manufactures to be carried on, but beyond certain limits, because they were *nuisances*, and generated *impure* air. This favoured a little of legislating upon words; while the great body of facts, and the principle which pervaded the whole evidence, and the true interpretation of the phenomena, seemed to be overlooked. A public regulation, which was wrong in principle, could not be expected to command universal respect. It was an unhappy occurrence when the people complained of the laws; but it was likewise unhappy that they should ever have reason to complain.

almanac for 1797, (a compilation containing much prudential and economical matter,) there is a GOOD FAMILY RECEIPT, by which any meat, ever so stinking, may be made as sweet and wholesome in a few minutes, as any meat at all. The receipt is as follows: "Take some white ley, that is, boil some clean ashes in water; let it stand till it settles; pour this off as clear as rock-water; boil your meat in this three or four minutes, or till it is sweet, then wash it and dress it in any way, and no person could discover it had ever been fetid, or stinking. This will be found a useful communication to the army and navy, where a *solution of potash* may be used, instead of the white ley." I have learned, that some of the hucksters in the city of New-York, make a practice of buying up stinking beef, and tainted meat of all sorts, at the public sales, (our buyers and sellers do not consider this sale of damaged provisions as injurious to the public health,) for a very low price, and of sweetening them by washing and soaking in *soap-boiler's ley*. They find that a few pails-full of ley will restore to eatable condition a barrel of stinking meat, which, by *this operation of the potash*, is restored to a sound state, and sells for as good a retail price as if it had never been corrupted at all. Can there be any thing more decisive as to the effect of *this alkaline salt*, in damping the pestilential fumes already risen, and preventing the extrication of more?

E X T R A C T S

FROM A

DISSERTATION ON THE MEDICAL AND CHEMICAL
HISTORY OF

SEPTON, AZOTE, OR NITROGENE;

AND

ITS COMBINATIONS WITH THE MATTER OF HEAT AND THE
PRINCIPLE OF ACIDITY.

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*The Difference between the gaseous Oxyd of Septon,
and Atmospheric Air.*

THEY both consist of like ingredients, but vary in their proportions and combinations. The atmosphere is composed of 73 parts of septous gas, and 27 of oxygenous; but these are mixed together *mechanically*, just as wheat and rye are distributed in a heap of grain, or as sand and shells lie dispersed along the sea-shore. The particles of each are fully mingled with those of the other; but during all this intercourse, both septon and oxygene retain their attraction for caloric in full force; and while this continues to be the case, no union takes place between the *putrifying* and *acidifying* principle, as, in common circumstances, both possess a stronger attraction for the matter of heat than

than for each other. The proportions of these ingredients, in our atmosphere, are not, however, invariable; for sometimes the one, and sometimes the other predominates, according as the one is absorbed or fixed, and the other effused, or set loose in greater quantity in the operations of nature. The proportions stated seem to be about the mean ratio; and the reason of their not more frequently combining and spoiling the respirability of the atmosphere is, that when once they assume the form of gas, they have less affinity to each other than to the fire, which gives them their permanent elasticity: the requisite to their chemical union then is, *the abstraction of their caloric*.

If there is any process in which the principle of acidity and of putrefaction lose their quota of heat, and enter into combinations with other elements, to form organized or other bodies of complex structure; in that case, the main impediment to their union, caloric in excess, will be removed, and there will be a possibility of their junction. It is admitted, that septon and oxygene enter into the composition of certain animal and vegetable substances: but, in the living state of these, they are connected with other elements, in triple and quadruple alliances, and continue thus united until their connection is severed by the disorganization of their fabric after death.

There appears thus a situation, during the decay of organized bodies, in which naked septon and oxygene may come within the sphere of each other's attraction, without entering into an intermediate state of gas, by union with caloric: and in this way, it is probable, the nitrous acid is formed during putrefaction. The process is as intelligible and easy to be conceived, as any instance

of chemical connection whatever. The case, at the same time, is not by any means peculiar or unparalleled; for the union of carbone with oxygene, to form fixed air (carbonic acid gas) in the lungs, during respiration, and of hydrogen with oxygene, to constitute water in the same function, is brought about in an analogous way: and Professor Mitchill supposes it is in this way that *animal and vegetable secretions are effected*, as there appears to be some machinery in their economy whereby the ordinary impediments to chemical union are removed, and compounds afforded thus, that are producible in no other way. This he suspects to be chiefly effected *by depriving oxygene, hydrogen, and septon, of the proportion of caloric necessary to convert them to gases*; and thus bringing the uncombined elements into closer connection, with stronger appetites to adhere to other substances and to one another; and so, most probably, gum, mucus, bile, resin, pus, sugar, starch, &c. are formed.

Hence it is apparent, that both during the life and after the death of organized beings, compounds are made that are not imitable by any art, or to be produced any where else, or by any other means, owing to the singularity of the circumstances in which the component elements then and there exist. Among these animal products, the septous (nitrous) acid, and the other combinations of septon, with the principle of acidity, have not generally been viewed in a proper point of light, either as respects their origin or properties. The alkaline quality was always thought to characterize putrefaction; and the exhalations from corrupting animal substances have ever been deemed to be some modification of ammoniacal gas. The extri-
cation

cation of this species of gas, in common cases, though it appears highly improbable, may, however, possibly take place; but even upon the supposition that ammoniac should be formed, yet the extrication of it, as will be shewn hereafter, would appear totally inadequate to the explanation of the phenomena ascribed to it.

It is only said, in addition to this, there is another compound, formed, at the same time, by the union of the principle of acidity with the same radical, and that, according to the proportion in which the former connects itself with the latter, will septous oxyd, septic gas, septous acid, and septic acid, be produced. The viscera and muscles of carnivorous and graminivorous animals contribute eminently to the formation of these; while, in the livers of fishes, and some other species of animal machinery, putrefaction disengages septon by itself, which, joining with caloric, constitutes *mere septous (azotic) gas**, as another occasional result of this kind of disorganization. According to the texture and composition of the animal or vegetable material, will the result of putrefaction be; the septon, in the simplest case, barely uniting with the matter of heat into septous (azotic) gas; or, in other instances, combining with hydrogen into volatile alkali, or joining, under yet other circumstances, with oxygen, in varied proportions, to form the several enumerated products.

It is stated, on the authority of the Dutch chemists †, that the septous (azotic) oxyd consists of

* Mitchill found by experiment, in the autumn of 1795, that the fluid distending the abdomen of a swine putrifying after being strangled, was a mixture of septous (azotic or phlogisticated) and carbonic acid (fixed) airs.

† Deiman, Troostwick, &c.

63 parts of (septon), united with 37 parts of oxygene. The proportion of the principle of acidity is greater in *this chemical compound*, than in the atmosphere, where it is *wholly disengaged and separate*. How then, it has been asked, can *the base of vital air, the very principle of animation*, become so very deleterious as to excite distemper and destroy life, by merely combining in a small over-proportion with septon? Just in the same way, it may be replied, that, by combining in a somewhat larger proportion, it constitutes, with the same radical, the more caustic and destructive septous (nitrous) acid itself. There is no reasoning *a priori*, from the known qualities of two substances, in their distinct state, to what will be the qualities of the *tertium quid* they compose by union. It may be inquired, if these two elements are so prone to unite after death, why, as they are in constant neighbourhood in the animal solid, they do not associate during life? It is probable in certain morbid cases they do; and cancer, and some other eroding and incurable ulcers of the lungs, face, neck, uterus, &c. have been suggested as examples of its causticity when thus produced.

Notwithstanding there are but four stages of combination discriminated betwixt septon and oxygene, yet it is not unlikely that between each there are intermediate degrees of connection; that, for instance, a given compound, divided into 100 parts, may have 99 of septon and 1 of oxygene, or 98 of septon and 2 of oxygene, and so on, or *vice versa*, in all the possible varieties of combination. This enlarged idea of the subject will go a great way toward the explanation of the *degrees of poisonous activity* in different cases of contagion; the materials of which, though always of the *same kind*, may vary in their proportions, and impart
to

to that mischievous fluid more or less virulence and activity.

According to this doctrine, septous acid ought to be capable of resolution into atmospheric air. In the explosion of gunpowder this almost happens, for during the inflammation the saltpetre is decomposed; and while the septon of its acid is set loose, the oxygene joins the charcoal to form fixed air. It is not impossible that in some instances of imperfect explosion, the septous oxyd may be formed in this way.

When putrifying substances in cities and marshes exhale this dangerous fluid, there is commonly a considerable degree of heat prevalent. In the city of New York, the common range has been stated to be between 75 and 85 degrees of Fahrenheit's scale; but these fluids may be, and often are, emitted in cooler temperatures; and where the decaying materials are moist and plentiful enough, the gaseous oxyd may continue to rise in the highest temperatures we experience in our latitude of 40 deg. 40 min. What has been thus stated, is therefore to be considered as only the ordinary range in common seasons, wherein this species of air is produced from the remains of dead bodies exposed to the vicissitudes of the weather.

As to its production within doors, an opinion is entertained, that the human body, whose temperature is nearly the same in every season, may produce it during the coldest part of winter; and in ships, prisons, and in some tenements of large cities, the process seems to be constantly going on. The air so formed does not seem, however, to gain its utmost activity until the arrival of hot weather, *no degree of cold we are yet acquainted with being capable of fixing it, though ice very effectually stops its further formation from external sources.*

Hence it is hoped the difference between the *contagious fluid* and *atmospheric air* will be apparent; the one being a *chemical connection*, whereby both the ingredients lose their separate qualities; while the other is a *mere distribution, or dispersion of the particles of each among those of the other*, possessing still their discriminating qualities, and totally free from any combination with each other: the former brought about by reason of the near approximation or stronger attraction of the ingredients in the decaying body, before they combine with caloric enough to turn them to gases; while in the latter, such is the cohesive power by which septon and oxygene, when once as gases united to caloric, stick to it, that the weaker attraction they have for each other cannot in ordinary circumstances overcome it; and thus, in *the same temperature*, the elements may form septous oxyd or not, according to their respective relations to other elements at the time, and the strength of alliance by which they are bound to them. If the quantity of oxygene is greater in the oxyd than in the atmosphere, it is not more surprising than in the example of arsenic, quicksilver, antimony, sulphur, phosphorus, and charcoal, acquiring great change of qualities, and becoming vastly more active by being charged with a sufficient dose of oxygene; for, like several of the enumerated substances, septon is both an *oxydable* and *acidifiable base*. That such a precise proportion of the base of vital air should be necessary to convert septon into an active poison, is not hard to comprehend, since without it septon is little better than a poison; it possesses no salubrious properties, and at best deserves but the negative character of not being mischievous.

What

What has been now offered is sufficient to show the nature and theory of these septous and septic compounds, and to make it appear that the salubrity of the atmosphere, whose component parts are commonly disjoined or distinct, is spoiled immediately on their forming a junction, or becoming *chemically* combined.

This conclusion is confirmed by the following observations of Dr. Beddoes * : “ The nice balance of attraction between the two constituent parts of the atmosphere deserves notice. These two substances, when closely united, form nitrous acid. If, therefore, they were not by some circumstances prevented from uniting closely, all the oxygene, with part of the azote, would be changed into a highly concentrated acid, and the waters of our globe would be converted into *aqua fortis* (septous acid).”

And this is a perfect fulfilment of what Fontana† conjectured long ago : “ Thus then the respirable and wholesome air of the atmosphere is composed of nitrous acid alone ; but it is united with more or less phlogiston, which varies the quality of it, not only in proportion to its quantity, but also in proportion to its combination ; because, after all, phlogiston itself is a compound of several principles, presenting itself to us under a thousand different aspects, and which, combined variously with other substances, forms all the factitious airs with which we are acquainted.

“ If the nitrous acid is convertible into air, and if the atmosphere is composed of this acid decom-

* Considerations on the medicinal use and on the production of Factitious Airs, p. 18.

† Recherches Physiques, p. 165.

posed, and deprived of its natural phlogiston, it might happen, in this view of the subject, that common air, in undergoing decomposition, should change to the nitrous acid, and might even form saltpetre itself: it is certain that nitre cannot be produced but in open air; that it is not formed but in places where phlogiston abounds; and that it is a salt highly charged with phlogiston."

*The Indentity of what has been termed Contagion,
and Marsh Miasmata.*

It is known that onions, plants of the tetradynamous class, the paste or glutinous part of bread, &c. afford some results upon analysis greatly resembling those which animal substances yield. When natural productions of these sorts go into spontaneous decay, it may be expected they will yield aëriform products, nearly allied to the animal class, if not quite the like. Maize and rice, consisting almost wholly of amylaceous matter, emit very little or no azote, and ought therefore to be most wholesome articles of diet. The flour afforded by wheat, rye, and buck-wheat, contains a pretty large proportion of glutinous matter, abounding with azote, and should on that account be more prone to excite uneasiness in the stomach and bowels, by running, in certain cases, into a putrefactive state. Cabbage, onions, mushrooms, &c. should also, when taken as food, be followed by much the same consequences as meats. It is very difficult to draw the discriminating line between animal and vegetable nature; and it is uncertain whether the animal resemblances may not extend much farther than the *Fungi*, *Gramina*, and *Tetradynamia*. So far as plants or their parts approach

approach in their nature and composition to animals, will they be capable of resolution into similar products. The difficulty started concerning vegetable putrefaction, as affording results essentially varying from animal, is so far explained away, and reconciled to fact.

The favourers of this distinction, it should seem then, have adopted their opinion too hastily, having never ascertained that what they call *marsh miasmata* were the result of pure and unmixed vegetable putrefaction. In declaring that it was so, they have set up an hypothesis, and assumed a principle without proof or even probability to support it. I shall take, as instances of countries exposed to these vegetable miasmata, Bengal, on both sides of the Ganges, Louisiana, overflowed by the Mississippi, and Egypt, covered annually by the Nile. These tracts of country, after the evaporation or withdrawing of a considerable part of the waters, are found to have an unhealthy air. This unwholesomeness is not imagined to proceed from any alteration in the existing atmospheric ingredients; nor in that natural distillation called evaporation, is it imagined that the atmosphere elevates, by chemical attraction, any thing but pure water. As long as this continues to be the case, there is no uncommon complaint of sickness. But by and by the mud begins to be bare, and the air grows pestilential. Hence, it is said, proceeds the *marsh miasma*, from the mud and slime. Let us then inquire what this mud or deposition from the water is. Is it clear vegetable matter? It is known to naturalists, that the *species* of large animals are comparatively *few*. It is likewise known, that their *numbers* are comparatively *small*. Nor is it less evident creation teems more particularly with animal existence in the warmer latitudes. The
myriads

myriads of wild bees, locusts, ants, cockroaches, sand-flies, musquitoes, which travellers have noticed, and hundreds of other *insect species*, of which they knew neither history nor name, must, by their annual deaths, make an incalculable mass of animal putrefaction. The frogs, newts, lizards, alligators, and other amphibious creatures, which yearly expire, add greatly to the heap. The different verminous kinds, inhabitants of water and mud, contribute mightily to the sum. And to all this must be added the vast amount of fishes which die natural deaths, or are left to perish or rot upon the shores. The remains of all these animal productions are mingled with the waters of these large rivers, as they wash and cleanse the countries they pass through, from their sources in the mountains to their disembogucment in the ocean; and yet, while such is the history of the mud left by the receding rivers, and such the reason of its extraordinary fertility, the effluvia arising from it has been considered as something different from animal exhalation.

The case of stagnating water in ponds and swamps is precisely similar, abounding in animal productions, which undergo putrefaction during the evaporation of the water, and the greater heat the surface of the mud acquires, when that process begins to abate.

The same thing occurs sometimes during the long calms ships endure off the western coast off Africa, where the relics of animals, which float within a few fathoms of the surface, now rise to the top, and form a putrid scum on the ocean water.

It is indeed questionable, whether there exists in nature an instance of any thing like unmixed vegetable putrefaction, upon a very extensive scale.

Bogs

Bogs of turf and of peat-moss come nearest to it; and the water issuing from thence is very palatable and wholesome. The formation of soil or *mould* in forests is an analogous process, but not of itself particularly noxious; for wherever much morbid exhalation arises from it, there is ever an admixture of animal matter; and to this quickening of the putrefaction of manures does newly-cleared land owe its abundant fruitfulness.

Observations and Facts, proving the Identity of Cause, in the Production of Fever and certain other Diseases.

CULLEN differed in opinion from Sydenham, and thought it probable that in each of the species of disease enumerated in his Nosology, the contagion was of one specific nature*. He thought it probable that contagions were not of great variety, since they seemed to proceed much from one common source. "As to miasmata, we know," says he, "only one species of it, which can be considered as the cause of fever, and from the universality of this it may be doubted if there be any other." He conceived it did not differ in kind, but varied only in the degree of its power, or perhaps as to its quantity in a given space†. Neither contagion nor miasmata were, as he imagined, of great variety‡: and both arise from putrescent matter§. The changing of the type of fevers, by tertians and quartans becoming quotidians, quotidians turning to remittents, and remittents altering to those of

* Practice of Physic, sect. 79.

† Sect. 84.

‡ Sect. 85.

§ Sect. 85.

the most continued kind, appeared to Cullen to evince, not only that every fever consisted of repeated paroxysms, differing from others chiefly in the circumstances and repetition of the paroxysms; but that it was fair and proper to take a fit of pure intermittent as an example and model of the whole*.

Balfour, in a treatise on putrid intestinal remitting fevers, comprehends the fevers called nervous, contagious, low, putrid, and malignant, together with many febrile complaints in the East-Indies, which appear with peculiar local affections. He ascribes this class of ailments to a putrified state of the *mucus lining the intestines*, which being absorbed into the blood, causes the febrile state. *This mucus (he thinks) receives the infection first by means of contagious matter taken into the stomach with the saliva*†.

Wade‡ considers fevers and dysenteries to be ailments of a kindred nature, and prevented and cured in the same way. He considers fevers universally to arise in those latitudes from the bowels and the matters contained in them; and are to be cured of course by evacuations. He also thinks puerperal fever may always be prevented by effectual evacuations from the bowels after delivery.

Chisholm, in his observations on the malignant pestilential fever which raged at Grenada, in the West-Indies, remarks: "Although the contagion seemed to vary much in different descriptions of people, it is highly probable that the virus of the

* Practice of Physic, sect. 32.

† Monthly Review for July 1794, p. 336.

‡ Diseases of the East-Indies, p. 130.

contagion itself was uniformly the same, only variously modified by particular constitutions, habits, or mode of living, &c.”

Writers have made a distinction between intermitting and remitting fevers. This may be of use in medical description and conversation; but from intermittents varying their types, and after a while becoming remittents, and then assuming the continued form, and *vice versa*, it is argued fairly that they all spring from one common cause.

Fordyce * declares, that he knows from his own observation, which is corroborated by the authority of others, that *intermitting fevers are infectious*; and this is another trait of resemblance between the two forms of fever. And Jackson † observed the changes from intermitting fever to dysentery, and from dysentery to intermitting fever, on this continent, so frequent in August and September, that he had no doubt of their dependence on the same general cause. The disease described by Zimmerman ‡, as occurring in Switzerland in 1765, shews the connection between *putrid fever* and *dysentery*. The analogy between the two diseases is very striking, and appears to indicate respiration, injured by a bad state of the atmosphere, combined with local affection of the alimentary canal. When the bowels were easy, the pulmonic organs alone were affected; the disease seems to have been what he calls the putrid pleurisy of Loufanne.

And if it has been explained, how the difficulty of animal contagion and vegetable miasmata can be got over and entirely reconciled, then *one ge-*

* Dissertation on Simple Fever, p. 111.

† Fevers of Jamaica, p. 331.

‡ Treatise on the Dysentery, ch. 1—2.

neral cause will be acknowledged to prevail; and according to the proportion of the ingredients entering into the contagious combination; according to the sparse or concentrated state in which the product is applied; according to the part or parts of the human frame to which the application is made; or, according to the readiness or slowness with which they take upon themselves morbid action, and according to the co-operation and concurrence of other circumstances, will the effect brought on by the agency of this cause be. So that the recurring to a multiplicity of contagions appears both unnecessary and unphilosophical.

Thus says Merli, in his description of the contagious epidemic fever at Naples, in 1764: "This mischief, contagion, or poison, or by whatever name you are pleased to call it, produces in some a *malignant continued fever*; in others a *malignant double tertian*, or a *malignant bloody flux*. It sometimes attacks the head; at others, seats itself in the breast, in the kidneys, or in some of the bowels; and wherever seated, produces the most violent and malignant symptoms."

"The disorders," says an intelligent writer*, "that prove fatal to soldiers and Europeans in general in the West-Indies, are of two kinds, namely, *fevers* and *fluxes*. They are the concomitants of armies in all parts of the world; but in tropical climates they rage with peculiar violence. There appears to be an intimate connection between them, for *they are frequently combined together, often interchange with each other, and it rarely happens that one is epidemic without the*

* Hunter's Observations on the Diseases of the Army in Jamaica.

other." He also affirms*, that "there appears to be an intimate connection between the *intermittent* and *remitting fevers* of Jamaica: the intermittent often running into the remittent, and the remittent sometimes terminating in an intermittent." He declares further †, that "there subsists an intimate connection between *remitting fever* and *dysentery*; the one frequently changing into the other, and the two often complicated with various degrees of violence. In some cases the dysentery ends in a fever, though much oftener the fever terminates in a dysentery, especially among the soldiers."

"From one cause, from the same infection," says Lind ‡, "I have frequently known to proceed what may be termed, from outward appearances, the *yellow patechial* and *miliary fevers*; and while, on a few, the contagion assumed an *intermitting* form, and was mild, in others it raged with a *constant* and violent fever."

"The influence of jail-infection || is much more extensive than is generally supposed. Of a similar nature is the disease we frequently read of in the public newspapers, under the names of the *scarlet*, *purple*, and *spotted fevers*, which often depopulates cities, and sometimes even whole countries."

Cleghorn § informs us that there seems to be a near alliance amongst all the succeeding diseases prevailing at Minorca. "Those who have the *rash* or *effere* to a great degree are very liable to *tertian fevers*: on the other hand, in the paroxysms of tertians, these cutaneous eruptions are apt to

* P. 14.

† P. 218.

‡ Essay on Seamen, p. 265.

|| Ibid. p. 323.

§ Diseases of Minorca, ch. ii.

break out. The *cholera morbus* sometimes hath its regular periods like a *tertian*, as the paroxysms of tertians are frequently attended with a cholera. Sometimes a *tertian* turns into a *dysentery*, or a *dysentery* becomes a *tertian*; and when one of these diseases is suppressed, the other often ensues: nor is it uncommon for *dysenteric fevers* to put on the form of *tertians*, and for the fits of tertians to be regularly accompanied by gripes and stools."

That the diseases produced by contagion and miasmata originate from the same cause, is countenanced also by Gardiner *, who coincides with the physicians of observation and experience, that marsh miasmata can acquire a power as noxious as human contagion; and when it does so, the distempers caused by it are nearly the same. Sir John Pringle was of this opinion, and so was Count Carburri. And what is more to the point, Dr. Mackenzie, who had resided a long time at Smyrna, and a longer at Constantinople, declares the common epidemic pestilential fever there, is the same with the jail or hospital-fever of England; and when this same distemper grows more virulent, with buboes and carbuncles, they call it plague.

Cleghorn † further asserts: "These *tertian fevers* have as good a right to be called *contagious*, as the measles, small-pox, or any other disease; for although in that season there certainly is a peculiar disposition in the air to affect numbers in the same way, yet those who are much conversant among the sick, are most liable to catch the distemper."

* See Animal Economy, p. 187.

† Diseases of Minorca, note to p. 132.

That the Cause of Contagion, and of many endemic and epidemic Diseases, is some Chemical Combination of Septon with Oxygene.

THE effluvia from putrefying substances, which constitutes contagion, is neither hydrogene gas, nor any combination of it with sulphur, charcoal, or phosphorus. These compounds are very volatile and diffusible, and form a large part of the disagreeable odour or abominable stench of decaying bodies. The stinking smell of substances is quite a different thing from infection: nor can carbonic acid air be the contagious material, though that exhales abundantly from some sources of corruption. It has been imagined, that ammoniacal gas was the injurious production, either by itself, or in combination with something else; but the sensible qualities of this, although it supports flame, and is miscible with water, serve sufficiently to characterise it, and shew it is not the deleterious cause in question. Besides its miscibility with water, and capability to maintain flame, though very faintly, alkaline gas possesses enough of peculiar qualities to distinguish it from every other animal production. We shall mention two of them: 1. When ammoniacal gas is mixed with water, it imparts to it a strong alkaline tincture; inasmuch that a water may be prepared in this way, having a stronger alkaline smell than any spirit of sal ammoniac at all. 2. Whenever alkaline air meets with carbonic acid gas, a combination of the two fluids takes place immediately, even in their aerial form, and concrete into oblong and slender crystals, which cross each other, and cover the sides of the vessel in which the experi-

ment is made, in the form of a net-work; the chrystals being of the same kind of volatile salt, obtained in a solid form, by the distillation of sal ammoniac with fixed alkaline salts. Hence, if ammoniacal gas be ever extricated during putrefaction, it would instantly discover itself by imparting an alkaline flavour to water; or, by combining with the fixed air, evolved at the same time, will combine into firm chrystals of volatile alkali. This, therefore, cannot constitute the matter of contagion. *This contagious cause we suppose to be sought for in the combinations of septon with the acidifying principle, and to manifest itself in the septous oxyd, and the vapours of the nitric acid itself:* and in this view of the matter can we account for the production of contagious diseases in different parts of the world, wherever the causes favouring the production of these compounds exist.

Upon this idea, the occurrence of the epidemic in this city last summer may admit of a satisfactory solution; from the existence of the collections of vegetable and animal substances in the different divisions of the city, and in a particular manner in that part of it where the malady raged with peculiar violence; since, on examination, it has been found, that there existed in that neighbourhood large heaps of manure, collected by the scavengers from the streets and avenues of the city, and which were in that situation, undergoing the necessary disorganization for agricultural purposes. Now it has been pretty fully stated, that under such circumstances, those septous compounds, which are the immediate causes of contagious and infectious ailments, are uniformly extricated by the application of heat and moisture; and when once so formed, their influence on the neighbouring inhabitants is easy of conception.

An analagous influence from the marsh effluvia arising from the borders of the Onondago lake, is related by Vandervoort*.

“ The marsh effluvia in this western territory, in many places, and particularly in this place, operates so powerfully on the human body, as to induce a paroxysm of an intermittent, in the course of four or five hours, and frequently death the seventh day.

“ From ocular observations in these marshes, it appears that the poisonous effluvia is generated from the putrefaction of vegetable matter, which, in its resolution, undergoes certain changes, which produce this noxious air. It is also evident that this air does not operate while the marshes are inundated.”

Moores† informs us, that in the state of Maryland, where the marshy grounds are more extensively prevalent, remitting and intermitting fevers prevail; and both diseases he ascribes to the same cause, differing in degree. “ Hoc vero ex observatione propria edidici nempe cum in Marilandia, æstivus et autumnalis calor minor quam solitus sit, tum populi in locis paludibus vicinis degentes febribus intermittentibus tantum obnoxii sunt, quando autem æstatis et autumnæ calor intensior æstuet, tunc febres remittentes his ipsis locis epidemicæ grassantur.

“ In regionibus Marilandicæ calidioribus qualis Carolina est, paludes solis radiis ferri excoquuntur, ibique febres remittentes quam in Marilandia multo gravioribus symptomatibus stipantur et proprius ad

* Analysis of Balston mineral spring water, p. 17.

† Tract. Inaugural. de Febre Remit. Marilandica.

typhum icterodem accedunt. Monstrant hæc exempla quantum febres cum ejusdem tum diversarum regionum secundum tempestatis calorem variant. Hæ autem varietates modo indirecte a calore pendunt quippe paludum miasma pro causa omnes agnoscunt et secundum vim ejus febres remittentes vel intermittentes sæviant ; vis vero miasmatis ad tempestatis calorem semper quadrat."

Dr. Valentin, who formerly resided in Cape François, in the capacity of physician to the camps and armies of St. Domingo, and who was in Norfolk in Virginia during the sickness of 1795, in a letter to Professor Mitchill, has the following comparative remark on the diseases of the two places : " They offer the like train and concomitancy of symptoms : I have here followed the same method as there, with an equal success when I was called in season. I do not contest about the word *yellow fever* ; that I consider but as an effect, or a symptom, for it is not a new malady." He adds also his entire conviction of its local origin in Norfolk, and other sea-ports of the United States.

The contagious fluid emitted from living bodies is most plentifully conveyed in the breath, perspiration, and stools. It has been said to have a peculiar smell, and capable of being distinguished from all other known odours. They who have had infectious air fresh in their nostrils have called it an earthy, disagreeable smell, affecting in some degree the organ of taste, and extending down into the stomach : some have compared it to the vapours issuing from a newly-opened grave, but without the cadaverous stench ; others think it resembles the effluvia of rotten straw, and others again are of opinion it is like the exhalations from confluent small-pox at the turn of the pustules.

From

From the circumstances in which it is emitted, it is presumable it is seldom admitted to the organ of smell in its *pure form*, but is generally accompanied with some other gaseous emanation floating about with it. Perhaps it is impossible to obtain it in a pure form, but by an artificial process; and this may be the reason of the diversity of opinions concerning the odour ascribed to it, which is probably not so much occasioned by the contagious fluid itself, as by the other matters that are frequently extricated at the same time with it. After diffusion through the air to some distance, it seems incapable of exciting any sensation at all in the organ of smell. From this inodorous quality of it, added to its capacity to support flame, may some idea be formed why it has hitherto eluded the search of inquirers.

The facts related by Mr. Martin, and by Mr. Townsend, concerning the vapours rising from the saltpetre soils of Bengal and Spain, and their power of producing fevers, apply with great force here. They are nitrous earths naturally formed. The filth collected in the streets of large cities is a nitrous soil also. The effluvia from the saltpetre soils of cities produces effects very similar to those observed in the neighbourhood of natural nitrebeds. This is verified most strikingly, as before remarked, in the disease endemic in New York in 1795. The inference is, that the septic (nitric) vapours, according to Thouvenel's conclusion, are in both cases the cause of the consequent diseases.

The Operation of the Causes of these endemic and epidemic Diseases on Vegetation.

THIS is a subject of the greatest importance, as it involves a material article of the police of crowded cities: for should it appear that the vegetable economy was capacitated to disarm these compounds of their baneful properties, the joint co-operation of convenience and usefulness would stimulate the officers of government of these places to disseminate vegetable life with as much zeal, as the prejudice of ignorance has supported the measure of exterminating it from the streets and public walks of the citizens.

No direct experiments, however, have yet been made on this subject; but from the phænomena of the mitigation of the Samiel and Harmattan blasts in Africa, on their passing over tracts of country cloathed with vegetable verdure, it is highly probable they have an essential influence in altering or decomposing the elements of such pestilential fluids.

Its Physiological and Medical Operation.

HAVING, as we hope, ascertained the cause of most endemic and epidemic diseases, and the sources of their formation in the various ways we have considered them; we come now more immediately to the application of these causes on our bodies; and in this view of the subject we shall consider the operation of them on different parts of the body.

The Operation of the Gaseous Oxyd and Septous Acid Vapours on the Lungs, including Brute Animals as well as Man.

THE operation of these causes on the lungs is accompanied, according to their degree of continuance, with the following symptoms:—Hoarseness, cough, catarrh, excretion of mucus from the larynx or bronchia, lassitude, languor, shivering, impeded oxygenation of the blood, the contractions of the heart diminished, intermission or slowness of the pulse, the colour of the hands and arms brown, livid, or black, laxity of the muscles, hæmorrhages, anxiety, coldness of the extremities or of the whole body, stupor, coma, delirium, suffocation, and death frequently direct on the first attack; the blood in a like condition as in submersion or suspension. Though the effects now enumerated seldom all occur in any one case, some or other of these symptoms will occur, more or less, in different persons, dependent on the concentrated form in which the cause is applied, the duration of its continuance, and the facility with which the patient's constitution accommodates itself to the operation of such a new stimulus. And in this way it is, that of a number of individuals, labouring under the influence of causes of this sort, in like situations and circumstances, one shall have an aggravated, another a mild, and a third no disease whatever; and so on in all possible degrees of violence or mildness.

For a more clear and satisfactory illustration of these remarks, I shall select, from medical history, a few well-marked and decisive instances of diseases induced by breathing an air thus vitiated.

Chisholm's

Chiffolin's * history of what he calls an uncommon epidemic fever observed in the island of Grenada, may be considered as a fair exemplification of the effects produced by this modification of atmospheric air, mingled perhaps with other non-respirable airs, and acting on the lungs of the soldiers, sickening in the barracks of St. George's, a remarkably unhealthy spot, *surrounded by marshes*. "The general type of the fever was that of a quotidian intermittent, but so extremely irregular as not to admit of a reference to any of the common species. It was truly anomalous, and so insidious as to endanger the life of the patient before any apprehension could be entertained of its fatal tendency. In almost every case, the patient seemed in a state of very great anxiety at all times, with eyes inflamed, and a little protruded; a strong expression of depression of spirits in his countenance; a very great degree of debility; and a sense of weariness, as if he had undergone excessive fatigue. But the symptoms which most troubled the sick, during both the paroxysm and the intermissions, if they can be properly called such, were an intolerable headach, with a throbbing of the temples, and a lethargic heaviness. During the intermission, whilst the patient was labouring under all or most of these symptoms, his skin was preternaturally cool; his pulse small, quick, and hard; and his whole body covered with a clammy moisture. The paroxysm generally came on sometime between eight and twelve at night; and its approach was indicated by a very great increase of the coldness, with shivering. These were soon

* See Duncan's Medical Commentaries for 1792, p. 267, et seq.

succeeded by violent heat, increased anxiety, and headach, and very frequently by delirium. It continued two, three, or four hours, and terminated in profuse diaphoresis; but, contrary to the usual form of intermittents, on the ceasing of the diaphoresis, the patient continued afflicted with anxiety, headach, &c. to the degree I have mentioned. The paroxysm in some was marked with infinitely greater violence than in others. In the case of one soldier, the paroxysm began about twelve o'clock at night, with all the most violent symptoms, at once a deadly coldness of the body, and excessive delirium. These, constantly increasing, terminated, in about two hours, in total insensibility, coma, and death. In a few cases, very little intermission could be perceived throughout the whole course of the disease: in these there was a continual alternate succession of shiverings and flushings, with a disagreeable clamminess on the surface of the body, which never afforded relief. When, in such cases, any thing like distinct intermissions could be observed, they occurred at or a little before noon, and continued one or two hours; but in the others, the periods of shivering and diffusion of heat returned so rapidly, that scarce any interval could be perceived. The prostration of strength brought on by them was astonishing; and it was observed too, that the patients who laboured under the disease in this form had a much more ghastly countenance, sighed and moaned more, were infinitely more restless, were more subject to raving, and had more of a dirty yellow suffusion over the skin, than the rest.

“ In most of the cases respiration was extremely difficult; and on ordering the patients to make a deep inspiration, they were suddenly checked by
pain

pain more or less acute, which, however, they could not refer to any particular place, except in a few instances, when it was found most troublesome at the pit of the stomach, stretching to the hypochondria and spine. Some also complained of a *rawness*, as it were, from the throat to the stomach, or, as they expressed it, “a rawness and burning of their inwards.”

“A yellowness on the skin was by no means a constant symptom. The suffusion was general over the body; sometimes of a deeper hue, and sometimes, particularly about the eyes and on the neck, approaching to a livid colour.

“Dissections, in these cases, proved the whole intestinal canal to be sound.”

Lind * gives an account of a disease, operating pretty much in the same way, though with less violence, on board several ships in the British navy in 1759. “The fever which raged in all these ships greatly affected the breast. Some who were seized with it, as if they had been under a salivation, spit up six or eight pints of a thin phlegm in forty-eight hours; and, to prevent suffocation, were obliged to have their heads supported by pillows. Their blood was extremely viscid and glutinous. This I observed even during the last stage, in a person from whom it was then necessary to take blood for a pain in the breast, greatly impeding respiration. The head was affected often with a heaviness, and dull sense of pain, seldom with a delirium. Cough, spitting, and pricking pains of the breast, were the most universal complaints, &c. The attack of this infection began with shivering, succeeded either

* Dissertation on Fevers and Infections, ch. i.

by pain of the head or breast; seldom by an universal pain in the limbs, but most frequently by a tightness of the breast and cough, which last raised the acute pains in the chest. Several who recovered were afterwards distressed with a dulness of hearing; many relapsed. A midshipman, after being able to sit up for several days, fell again into the fever, which was accompanied with convulsions, and expired in thirty hours after the last attack, when his body was found covered with ptechie: a few died consumptive, being exhausted by the vast discharge in spitting. In four or five persons, there were symptoms of malignity; and out of above a hundred patients received into the hospital from those ships, eight died of the fever. The distemper, if it had occurred elsewhere than in the ships, might perhaps have been judged solely inflammatory, and to have proceeded from causes very different from the real ones."

Fordyce, in his *Dissertation on simple Fever**, has the following observations, which tend to the corroboration of this argument. "When the attack is fatal, it sometimes kills in five minutes: sometimes it requires half an hour; sometimes longer than that time. While the patient is yet sensible, violent head-ach, with great sense of chilliness, takes place; the extremities become cold and perfectly insensible; there is great prostration of strength, so that the patient is incapable of supporting himself in an erect posture. He becomes pale; his skin of a dirty brown, and he is soon insensible to external objects: the eyes are half open; the cornea somewhat contracted, and the

* Page 181.

patient goes off very soon: the pulse is diminished, and at last lost, without any frequency taking place; but if it be long before he dies, the pulse becomes excessively small and frequent," &c.

The effects induced by exposure to an atmosphere, charged with the causes of these diseases, as *pointedly* elucidating their operation on respiration, may be seen in Mr. Martin's account of the air of some parts of Bengal.

It may not be amiss to investigate *the operation and influence of these causes on brute animals.*

From the production of diseases in the human constitution, by exposure to marsh miasmata, and other like decompositions of animal and vegetable substances, it may appear highly probable that the *rot in sheep*, kept in low grounds, is analagous to the intermitting, and like diseases of the human species, and excited by the same causes. And a like investigation might prove that *the bloody murrain*, which sometimes prevails among *cattle*, is occasioned by a similar contagious cause, operating and producing an affection similar to our *dysenteric fever*, &c.

But that, while our habits suffer the operation of these causes in their superior degree of operation, brute animals have analagous experience, may be inferred from the following facts:

Sorbait, of Vienna, relates that, during the plague, "*larks*, so numerous in Austria during the autumn, were wholly wanting, so that not a single one could be met with; and *tame birds*, kept in cages, *all died*. Homer* mentions the death of *dogs* and *mules*, as the forerunners of the pestilence in the Grecian camp before Troy.

* Iliad, i. 69.

Thucydides * observed the pernicious and deadly effects of the atmosphere, during the plague at Athens, in the second year of the Peloponesian war, upon *birds* and *beasts*, and particularly on *dogs*.

Facts of this kind were not wanting during the prevalence of our late epidemic. It is stated to me, from undoubted authority, that *at the Belview Hospital*, the *fowls* and *chickens*, which fed about it, and like other poultry came occasionally into the hospital, (perhaps drank, and picked up crumbs about the house,) all suddenly died without any ostensible cause; on dissection, the appearances were similar to those of the human species who have died of putrid diseases. And in a part of the city, where there existed comparatively a small proportion of the epidemic influence, the *ducks* kept in yards, and which received the usual attendance as to food, all died off in such a manner as to excite the remarks and surprise of the inhabitants.

Fowls, in some of the yards, sickened, and some died; but after a while, the survivors experienced no inconvenience. Bruce mentions the deadly effects of the Simoom blasts, in the African deserts, upon all breathing creatures. Cleghorn observes, that in some of the vallies of Minorca, *beasts*, as well as men, suffer; and it is related by respectable authority, that *horses* have been incommoded by the autumnal air of Onondaga, for some time after being carried on to the low lands.

* Book ii.

On the Alimentary Canal, or Stomach, and Intestines.

How the aforesaid Septous Combinations may be conveyed into the Alimentary Canal of living Animals; or generated there from the Corruption of the Food; and of the Effects they produce in both Cases, by acting on the Stomach and Intestines.

1. FROM the properties of the causes of contagious and infectious diseases, then, we infer the occasional operation of these in the alimentary canal, by their introduction *by the saliva and watery parts of our food*: in corroboration of which mode of operation, we are presented with the following reflections and facts from their respectable authors.

Gardiner observes, that the manner in which the causes of certain malignant fevers, arising from marsh miasmata, human or specific contagion, get into our habit, is by the noxious effluvia taken in with the air in respiration, mixing with the *saliva*, and, by deglutition, conveyed into the stomach, where by certain changes wrought on the gastric fluids, and their particular stimulus on the nerves of the stomach and bowels, they prove the cause of fevers, differing from one another according to the nature of the infectious exhalation. “ This I have always thought to be the most probable way that infections are received by us, and of their acting on our system, in the production of fevers *.”

This opinion of the miscibility of the infectious effluvia of malignant fevers, with the *saliva*, and

* Animal Economy, p. 196.

of its afterwards passing into the stomach, is upheld by Turner, physician to the military hospitals in the West-Indies, in a letter to Sir John Pringle, who says, that he escaped the infection of the hospital fevers by chewing tobacco during the time he was on his visits to the men in the hospital, imagining that all putrid and contagious effluvia entered and infected by the *saliva*, which he took great care not to swallow whilst he visited the sick *.

Lind believed in this mode of receiving contagion, who says, “ Swallowing the spittle in infected places is justly deemed a means of sooner acquiring the taint, upon which account neither the nurses nor any one else should be suffered to eat in the hospital †.” And he relates an occurrence which may unquestionably be instanced as operating in this manner :—“ A company of gentlemen belonging to his Majesty’s ship the Phoenix, taking the diversion of hunting and shooting at the mouth of the river Gambia, by following their game into a large swamp, were all of them affected by its putrid effluvia. They were immediately seized with sickness, vomiting, head-ach, and a constant hawking and spitting from a disagreeable smell which (as they express it) seemed to remain in their mouth and throat. Upon returning to the ship, each of them was ordered a vomit, which immediately removed all those complaints ‡.”

And again ||, “ I am apt to think, that an infection from whatever impure fountain it is derived,

* Med. Annot. vol. v. p. 472.

† On Hot Climates, p. 111.

‡ Ibid. p. 138.

|| On Fevers and Infections, part II. p. 65.

does first discover itself by affecting the stomach and intestines."

Balfour's opinion corroborates this argument, as we have seen in our collection of observations and facts proving the identity of cause in the production of fever, and certain other diseases*.

Rush† relates, that "in small rooms, crowded, in some instances, with four or five sick people, there was an effluvia that produced giddiness, sickness at stomach, a weakness of the limbs, faintness, and, in some cases, a diarrhœa."

Mitchill relates an instance of a gentleman who received the fumes of a dysenteric purging: some uneasiness of the stomach, and qualmishness, came on, which, in a few hours, ended in a *looseness*. A similar indisposition was brought on in another, by receiving the fumes of a corrupting corpse. In both these instances, it appears as if the infection was swallowed with *the saliva*, and thus operated as a purge.

Mr. Van Eems‡ informs us, that if the abdomen of an animal that has lain some time under water after drowning, suddenly burst, a most active and penetrating fluid proceeds from it, very injurious to the eyes, lungs, and stomach; and instantly destructive to the appetite, inasmuch as to provoke nausea, vomiting, and even to bring on dysentery.

2. Another mode in which the diseases dependent on those causes may be produced, is by

* See page 23.

† On the Remitting Bilious Fever of Philadelphia, 1793, p. 107.

‡ Prælection. Boerhaav. 248.

the disorganizing process, which the Ingesta take on, in the stomach and bowels themselves.

The human constitution derives its principal support from foreign materials, received into the digestive organs: and the due performance of this necessary function is therefore indispensably requisite to the healthy condition of our bodies: this state is preserved by the influence of the gastric liquor and saliva in the stomach, and by the pancreatic and bilious juices in the small intestines; but these healthy secretions are again dependent on the vigour of the organs of digestion, which is increased or diminished by the matters taken into them. These substances are derived from the animal and vegetable kingdoms, and in healthy digestion, they will sustain and nourish our systems.

But in cases of the prevalence of epidemic, and other like diseases, while the predisposing causes exist, it would be to be inferred, from our principle, that flesh-eaters, in an especial degree, should be liable to an attack of those diseases; for, from the analysis of the lean muscular fibre, we are enabled to understand whence may flow the septon, for the formation of the deleterious cause; and by the occasional use of vegetable substances, as well as from the animal matter itself; the other ingredient, oxygene, is afforded. A consequence is, that those substances which are deficient in either of the component ingredients, are those of the most salutary use in such cases: substances of this nature are the fat of animals, oil, butter, &c. which are known not to contain the septonous or putrefying base, and may therefore be had recourse to as food, with the most perfect safety; or, on the other hand, vegetables, as affording less septon than lean meats, and some of them scarcely any,

may be used with like freedom. And it is unquestionably owing to this mode of living, that Frenchmen are, comparatively, in so small a degree sufferers from these forms of pestilential ailment, in unhealthy countries and climates; whose habits of life are such as to draw by far the greater part of their nourishment from vegetable substances. To this effect, Jackson* observes, that "the French and Spaniards eat less animal food, and drink their liquors greatly more diluted, than the natives of England: they escape better from dangerous diseases, and this has been remarked to bear some proportion to the degree of abstemiousness they observe." Mr. Verdoni declares, that "the Greek christians in Smyrna, during the season in lent, when they eat only vegetables, are very seldom attacked by the plague, while among those who eat flesh the contagion makes great havoc. Thence the best means of prevention are to eat moderately, and not at all of animal food," &c.

In infected situations, those causes which tend to the debility of the digestive organs will contribute very much to the production of disease. Of this kind are the habitual use of too much ardent spirits, and other habits of intemperance; exposure to excessive heat, and other violent exciting powers, which, by their operation, induce an indirect debility of these organs; or the operation of fear, terror, and the like, may induce a similar operation, by an abstraction of the usual necessary stimulation. These favour the unhealthy disorganisation of the ingesta, by withholding the antiseptic powers of digestion and concoction, depending

* Fevers of Jamaica, p. 395.

upon a healthy state of the gastric secretion. When, by the operation of the above-mentioned noxious causes, this unhealthy and debilitated condition is induced, it is evidenced to us by tension, oppression, and belching; and still further, by the acid, putrid, and pestilential nature of the matters vomited from the stomach.

That an acid is vomited up in cases of this nature is ascertained by the sour taste, and by the erosion of the calcareous enamel of the teeth, in some instances. "I have," says Hunter *, "seen an instance of fever, in which it was necessary to give from half an ounce to six drachms of the powder of oyster-shells, to destroy the acid that was generated in the course of the day, which otherwise occasioned great pains and reachings." The green colour of the bile is known to depend upon an acid in the stomach; for we know by experiment, that the most healthy bile, whose colour is yellowish, will be changed to green by mixture, in certain circumstances, with an acid.

What the nature of this acid is may be collected from the account given by Wallis †, of a porraceous and black bile often seen thrown up by vomiting, which corroded metals, and boiled up on the ground like spirit of vitriol dropped thereon; and so austerely acid, that it set the teeth strongly on edge, and excoriated the throat. It is further related, that a man who had vomited up a large quantity of green, black, and acid bile, being agitated by convulsions, had a silver spoon put into his mouth, that he might not bite his tongue, and

* Observations on the Diseases of the Army in Jamaica, p. 161.

† Edition of Sydenham, vol. ii. p. 191.

in a moment it turned black, as if it had been stained with spirits of nitre; but the man had drank liquors soured with lemon-juice.

The coffee-coloured matter, commonly called the *black vomit*, which is ejected from the stomach in violent remitting fevers and plague, is to be considered as bile, impregnated with the more active septous combinations, as appears from its corrosive nature, noticed by dissectors in these diseases; or yet, in other cases, there is an admixture of blood, while by its own caustic nature the septous acid thus formed in the stomach had eroded the extreme blood-vessels of that viscus. Hillary * witnessed the existence of these appearances in the remitting fevers of Barbadoes, and observes, that “ great quantities of black, half-baked, or half-mortified blood, are frequently voided, both by vomiting and stool; with great quantities of yellow and blackish putrid bile, by the same ways.”

When, therefore, there exist such fluids in the stomach, the occurrence of nausea, excessive vomiting, painful burning of the stomach, and other symptoms of Gastritis, we should scarcely doubt, from the nature of these septous combinations, that on dissection, the various phænomena of inflammation would manifest themselves.

Conformably we find, according to the dissections of Drs. Physick and Cathrall, that in the disease of Philadelphia, in 1793, “ *the stomach and beginning of the duodenum are the parts that appear most diseased.* In two persons who died of the disease on the fifth day, the villous membrane of the stomach, especially about its smaller end, was

* Diseases of Barbadoes, p. 151.

found highly inflamed ; and this inflammation extended through the pylorus into the duodenum some way. The inflammation here was exactly similar to that induced in the stomach by acrid poisons ; as by arsenic, which we have once had an opportunity of seeing in a person destroyed by it.

“ The bile in the gall-bladder was quite of its natural colour, though very viscid.

“ In another person who died on the eighth day of the disease, several spots of extravasation were discovered between the membranes, particularly about the smaller end of the stomach, the inflammation of which had considerably abated. Pus was seen in the beginning of the duodenum ; and the villous membrane at this part was thickened.

“ In two other persons, who died at a more advanced period of the disease, the stomach appeared spotted in many places, with extravasations ; and the inflammation disappeared. It contained, as did also the intestines, a black liquor, which had been vomited and purged before death. This black liquor appears clearly to be an altered secretion from the liver ; for a fluid, in all respects of the same qualities, was found in the gall bladder. This liquor was so acrid, that it induced considerable inflammation and swelling on the operator's hands, which remained some days. The villous membrane of the intestines in these last two bodies was found inflamed in several places.”

And in a letter addressed to Dr. Duffield, of Philadelphia, from Professor Smith, we extract the following appearances on dissection, on one who died of our epidemic in 1795 : “ *The stomach and duodenum*

denum exhibited marks of high inflammation; the liver little altered from its natural appearance; the gall-bladder absolutely empty; the lower intestines quite sound, the lungs also; and the brain, except in being rather of a darker shade than is usual."

From these dissections it appears, that the superior portion of the intestinal tract is the part which more particularly suffers the operation of these causes of disease. And hence we are led to an inquiry into the causes which may account for this partial operation. From the nature of these septic combinations, which are supposed to be the offending causes in these situations, we are naturally led to inquire into the component ingredients of the bile, which is here emptied into the intestines, in order to ascertain if there do not exist in it some substance, for which the principle of putrefaction has a greater attraction than for the viscera themselves.

From the succeeding experiment of Saunders *, we analogically conclude, that such a substance does exist in the biliary secretion of the human species; as there is probably no very material difference in us from other animals, in this secreted liquor.

"A quantity of (ox) bile and diluted marine acid were put into a flask, and placed in a sand-bath, until they had acquired the boiling heat. On inspection, the separation into parts was very evident; and on committing it to the filter, it separated a colourless fluid, destitute of every bilious property. The *residuum* consisted of a very dark

* Treatise on the Liver, p. 103. London, 1793.

green mass, intensely bitter, and extremely glutinous. When examined, it appeared to be composed of an animal mucilage, in combination with a resinous substance.

“ But to ascertain in what way the acid had effected the decomposition, it became necessary to examine the filtrated liquor. It was therefore subjected to a cautious evaporation, and at a proper period was suffered to cool.

“ Under cooling, crystals were formed of a cubic figure, which decrepitated by heat, and possessed all the characters of common salt.

“ Therefore the decomposition was here occasioned by the marine acid engaging the *mineral alkali*, which it separated from the other elements of the saponaceous body, and, by uniting with that *basis*, formed common salt.”

Since then there is existing in our intestines this bilious secretion, whose alkaline nature we have thus seen experimentally ascertained, it will appear manifest, from the known attraction between the acid of the stomach and the soda of the bile, in what manner there shall take place a union of the septous acid with the biliary alkali, and thus a considerable part, or in some cases even the whole of the septous acid, being thus neutralized or saturated, that part of the duodenum below the opening of the ductus communis choledocus, together with the jejunum and ilium, in most instances, be unmolested by its inflammatory and caustic nature. These facts lead to a satisfactory solution of the phenomena of the extraordinary secretion of the bilious matter in those diseases; since it appears, from the preceding considerations, to be one of the resources of Nature, in counteracting this offending cause.

Or,

Or, if it should not meet with a substance to neutralize it wholly, or nearly so, it may pass on, and by the operation of the absorbent vessels, by being taken up and carried the round of the circulating fluids, be eventually manifested by imparting to the skin a yellow or other like suffusion: this explication of the tinge of the skin, in certain instances, is rendered probable, by the relation of a case of disease last summer, from undoubted authority, in which the following striking fact presented itself: A patient labouring under the epidemic, whose skin was of a remarkably yellow colour, was ordered an epispastic; on dressing the blister, after its operation had ceased, the scissars which were made use of to remove the scarf skin, were accidentally left moistened with the serum for about a quarter of an hour, when, on examining them, the observer was astonished to find they were oxydated as if dipped into a strong mineral acid.

And Van Swieten, in the plague of Oczakow, relates, that “the instruments which the surgeons made use of were turned as black and livid as if they had been dipped in aqua fortis.”

On the Cuticular Surface.

How the Skin of Persons, living in an Atmosphere thus vitiated, is affected, and how it operates on Wounds.

ON the application of the causes of disease which we have been considering, do we presume, are to be explained various efflorescences and eruptions occasionally besetting the external surface of our bodies. These appearances will be different, according to the concentrated or sparse form in which the causes are applied, and to the duration of

of their continuance ; and in this way partly is to be explained the peculiar tinges of the countenance in tropical climates, even although there shall not be present actual disease. And on the like principle, is explicable the absence of the different suffusions in contagious diseases, till some progress has been made in the morbid action.

To this mode of operation are probably referable the different kinds of eruptions which have been hitherto considered as critical depositions of humours from the body. From the greater specific gravity of the contagious fluids, the lower parts of the body, which are most constantly exposed to its operation, are first affected, and worse afflicted, than other parts of the constitution. Thus the legs of persons sick on ship-board, are often miserably ulcerated. Sometimes, in very unhealthy countries, an uneasy itching in the legs has been the first symptom of disease ; and upon pulling down the stockings, streams of thin dissolved blood followed ; soon after which a ghastly yellowness invaded the whole body, and the patient has died in less than forty-eight hours.

In 1764, the quality of the air at Batavia, which then exhibited a mingled scene of disease and death, was so malignant, that a slight cut of the skin, a scratch of a nail, or the most trifling wound, &c. generated quickly into a putrid spreading ulcer, which in twenty-four hours consumed the flesh even to the bone, as was experienced by the British frigates *Medway* and *Panther*, then lying there. From its disposition to adhere to bedding and cloathing, there can be no difficulty in understanding how miliary and petechial spots are produced, in many instances beginning about the back, loins, and inside of the thighs of those who are exposed, and extending thence over the covered parts

parts of the body, in those who are sweating in their own vapours and exhalations in bed: they have thus a contaminated atmosphere around them; and from its operation upon the sick, do these morbid appearances of the skin proceed. The occurrence of these sorts of fevers in low, foul, and dirty dwellings, &c. may thus be referred to the noxious air the patients live in, and to the infected beds they lie upon.

In the island of Jamaica * sores are very frequent and troublesome on the lower extremities. A trifling scratch, bruise, or hurt on the feet and legs, soon became a deep and spreading ulcer, which was always difficult, and sometimes impossible to be healed. Little injuries of these parts are very apt to spread rapidly, and form a large ulcerated surface. Granulations are hard to form, and, when formed, frequently become flaccid and mortify, the portion skinned over ulcerates afresh, and the sore becomes larger than ever. The bones are apt to become carious, the patient to grow hectic, and linger on to death. Fresh vegetable diet, full nourishing diet, calomel in smaller doses, to operate as an alterative, external application of almost all sorts of poultices, ointment, dry lint, &c. and a horizontal posture of the limbs, were so ineffectual, that Hunter relates it as the general result of all his experience, that ulcers of some standing, and of considerable size, in the lower extremities, cannot be healed in that country, by any means we are acquainted with. Yet these very patients, sent away from the island to Europe, had their ulcers frequently healed on the passage; the rest, except in cases of carious bones, soon recovered. Amputa-

* Hunter on the Diseases of the Army in Jamaica, p. 227.

itation in these other cases answered in England, but succeeded very badly in Jamaica.

Cleghorn* testifies to the analogy between Rome and Minorca, in respect to the troublesome nature of ulcers, on the inferior extremities. "Baglivi tells us, that at Rome ulcers of the legs are almost incurable, and wounds in them difficult to heal, while the like accidents on the head are quickly cured without any trouble. The same thing happens here, inasmuch that it is a proverb among the natives, "Minorca is good for the head, but bad for the shins."

Van Helmont† saw a man, who, upon touching some papers infected by the plague, felt instantly a pain, like the prick of a needle; a pestilential carbuncle made its appearance soon after on his fore finger, and he died in two days.

Van Swieten‡ relates, that a man, who stirred up with his foot the straw whereon the bed of one sick of the plague had been laid, "a little while after felt an acute pain in the lower part of his leg, just above the foot, as if the part had been scalded with boiling water; the next day the epidermis, or scarf-skin, was elevated into a large blister, upon breaking which a quantity of blackish liquor run out, and underneath a latent pestilential carbuncle was discovered."

* Diseases of Minorca, p. 78.

† Tum. Pest. p. 853.

‡ Sect. 1409.

On the Lymphatic and Glandular Systems.

How the above-mentioned Compounds operate upon the absorbent Vessels, and the Glands of the Body.

ON these parts of our systems we are presented with the phænomena occasionally attendant on dissections of dead bodies, from the peculiar gas thence arising, and of which an account is given by Mr. St. John*. “ I have known a gentleman, who, by slightly touching the intestines of the human body, beginning to liberate this corrosive gas, was affected with a violent inflammation, which in a very short space of time extended up almost the entire of his arm, producing an extensive ulcer of the most foul and frightful appearance, which continued for several months, and reduced him to a miserable state of emaciation,” &c.

A similar occurrence took place at the New-York Hospital, some months since, to two young gentlemen engaged in sewing up the abdomen of a patient who had been examined by the physicians and surgeons of that institution; each of them pricked one of his fingers in the operation: in a few hours afterwards, the part pricked in both these instances became painful and swelled; the inflammation extended itself along the arm, till it reached the axillary gland, on which it produced violent inflammatory action, which was of some considerable continuance. In one of these cases,

* Preface to Method Chem. Nomenclature, p. 111.

the lymphatic vessels were so highly inflamed as to become visible in the course of their distributions along the arm.

Russ† notices like affections of this set of vessels, in the Philadelphia epidemic of 1793. "I met with three cases of swellings in the inguinal, two in the parotid, and one in the cervical glands." And the epidemic of our own city in 1795 afforded some few instances of this sort.

The appearance of buboes in the plague, as remarked by every writer on that subject, may be taken as the operation of these causes on these parts of our constitution.

Nor are the brute animals exempted from the influence of these stimulating powers when applied to their œconomy. For *cats* and *dogs* have been known to suffer by the appearance of buboes, &c. as related by the writers on plague, and other like maladies.

A new Theory of Fever.

FROM the operation of these combinations, the learned Professor of Chemistry has deduced a new doctrine of fever. Judging from their effects, pestilential fluids appear to be always, even in their weakest form, somewhat of stimulants. In many instances, they are most violently so. Though their operation is modified in a very peculiar manner, when in a dilute form they impede respiration, or nauseate the stomach, as they then bring on a diminution of action and energy, amounting in the cold stage to a state of direct debility: when

† Page 68.

applied in great quantity and force, they kill instantly; when in less quantity, they produce an anomalous disease, of the form of which Chisholm's cases present us with instances; when in a weaker state, a common contagious catarrhal affection may be the consequence; when inhaled in a form yet more diluted, a remitting or intermitting fever may be the disease induced, of the form of quotidian, tertian, or quartan, or any of their varieties; or the remitting may be called jail, hospital, ship, camp, army, yellow, putrid, or bilious, malignant, pestilential, miliary, petechial, ardent, slow, continued, continual, dysenteric, contagious, or infectious, according to the circumstances that may occur in the progress of the disease.

“ The main difficulty left is to account for the cold fit of a regular tertian. This stage of fever I believe to depend upon impeded respiration; and the impeded respiration to depend upon the vitiated quality of the air, taken into the lungs; or in some slighter cases, where the stomach is originally thrown into a disordered state, the lungs, by association with that organ, are thrown into disorder too, and for a time perform their functions but imperfectly.

“ Thus I presume it is, that the impeded state of respiration is attended with a smaller evolution of heat and oxygene in the lungs; and consequently with more or less diminution in the circulation of the blood, and a proportionable degree of chilliness and coldness throughout the body. The duration and degree of the cold fit will correspond to the continuance and power of the causes disturbing the pulmonic organs, either by acting upon them directly or indirectly, through the intermedium of the stomach.

“ From

“ From the small quantity of heat and oxygene communicated to the blood in the lungs, and the consequent flow and feeble circulation of the blood, can the shrinking, paleness, tremors, coldness, debility, &c. &c. be sufficiently explained, as the constitution is now deprived of its two chief stimulants.

“ But why does not the continued operation of the vitiated air upon the lungs, or the associated condition of the lungs with the stomach, go on in an increasing series even unto death? The power of our constitutions to become familiarized to the action of noxious causes, is evinced by the innocent operation of poisonous substances, which, by frequent repetition, grow gradually habitual, and by custom, lose their primary operation. This disposition to become familiarized to vitiated airs, is apparent in the inhabitants of Africa, who are so seasoned to the air and climate they live in, that it excites no disturbance at all in their constitutions, while strangers fall victims in the greatest abundance. Now, common intermitting paroxysms, are instances of temporary seasonings, which the constitution experiences, of a kind quite analogous to what is perpetual with the Guinea negroes.

“ The cold fit sometimes does terminate in death; and this happens when the constitution cannot acquire the habit of enduring the noxious cause with impunity. In the generality of cases, however, the stimulus of the infectious gas loses its power to operate before the constitution is debilitated to death; and as soon as it becomes, for this time, so much accustomed to the vitiated air, as no longer to be disturbed by its presence, the cold fit ends. The length and violence of the cold fit will thus be *cæteris paribus*, in a compound

ratio of the impediment given to the respiration by the infectious gas, and the facility with which the constitution accommodates itself to its action; if three persons then inhabit one house, it is possible that one may become so quickly accustomed to the air, as to have no distemper; a second may have a moderate disease of but a few fits; while the third, possessed of a constitution not easily moulded to a new habit, may be incommoded by a violent and obstinate malady.

“ In every paroxysm of an intermittent, the infection thus wears itself out; but this is only a temporary reconciliation of the body to its action; when, after a repetition of fits, the disorder becomes milder and milder, and after a while wholly ceases. This is a case of lasting reconciliation; and in this way may a large portion of small intermittents cure themselves, while the credit is given to the bark! This power of habit daily does wonders, and labours more effectually for the good of the sick than bark, opium, and antimony put together.

“ The attack of these causes being thus for a time overcome, respiration grows free, full, and frequent; because there is now a greater appetite in the constitution for heat; more vital air is decomposed in the lungs, and more stimulus is applied by means of the increased heat and oxygen now in the blood, to the heart and arteries; these stimuli operate more powerfully on account of the accumulated excitability of the body; and a degree of excitement is thence induced which sometimes ends in death, sometimes causes delirium, and in almost every case exceeds the healthy temperature.

“ The duration and violence of the hot stage, will be *cæteris paribus*, in a compound ratio of the
15
excitability

excitability accumulated in the cold stage, and the heat and oxygene evolved in the hot one. When the excitability is exhausted by the operation of the stimuli, the violence of action will cease, and the body grow cool.

“ The doctrine of intermitting fever then, is briefly this: the vitiated atmospheric fluid, by interfering with the pulmonic action, brings on the cold stage, and would continue the same until its termination in death, did not the constitution, in the mean time, acquire such a habit as to gain a temporary insensibility to its action. This habit being induced, the cold stage abates by reason of the state of direct debility into which the body had been brought; anxiety continues, and by the quickening of respiration, heat and oxygene are set loose in the lungs, and becoming incorporated with the blood, now warm, and stimulate every part with more than usual power, and occasion the phenomena of the hot stage, which terminates as soon as the accumulated excitability of the system is exhausted. The sweating stage follows of course, as in other cases of the subsidence of violent action: for after a time, the exhausted excitability of the animal system, allows excessive action to go on no longer; the respiration grows more moderate and easy; the heart beats with less frequency and force; the arterial contractions are also more slow and health-like; and, as the arterial contractions relax, the hydrogene and oxygene of the blood now run together in the extreme vessels of the skin, and form the moisture which bedews the surface, and this afterwards flying off by evaporation, cools by degrees the whole body down to its ordinary temperature: and, as the arterial extremities of the rest of the body become

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dilated

dilated by the subsidence of excitement, the other secretions, which had been generally suspended during the fit, now return as before: after this, the constitution, so far accustomed to the breathing such an atmosphere, regains its former vigour and functions, as far as the exercise induced and functions injured during the several stages will allow.

“ The interval between one fit and the succeeding one, will be proportionate to the duration of the habit of resistance acquired. Some persons thus experience but one fit, and all is over; for, under the same circumstances they are never invaded by a second. Others suffer two fits, or a succession of fits, and, after a while become so accustomed to the stimulus, that, if always applied in the same degree of strength, its effect is no longer felt upon the body; in other instances again, so hard is it for the constitution to be moulded into a settled habit of opposition, that after enduring a great number of invasions, it becomes at length enervated and worn down, so much as finally to die exhausted.

“ The species of fever, whether quotidian, tertian, &c. will depend upon the readiness or quickness wherewith the offending cause gains a new ascendancy over the body, or breaks the habit. And to the mobility of the body, or ease with which the habit is broken, is to be ascribed, as well the frequency of the returns, as the duration and severity of the paroxysms.

“ The anomalous cases of fever, which have puzzled physicians to explain, and nosologists to arrange, are thus very naturally accounted for; since, according to the variation of the cause, as the noxious atmosphere may thicken or disperse, will be the variety in the effect produced; and, as
there

there may be infinite gradations of the deliterious cause, there may be endless varieties in the morbid effect.

“ And to this principle of the human constitution, I believe, may be referred all the febrile ailments from the most trifling intermittent to the more serious remittent, and the solemn form of continued fever.

“ Hence further may it be understood, how a succession of fits, long continued, may dispose the constitution to a repetition of fits, even when the morbid cause is away; for, though there may be a habit of insensibility produced to the vitiated air, yet a habit may in the meanwhile be established in the bodily motions of falling periodically into regular trains of action, even when the original cause is withheld. Here then will be produced a habit of having paroxysms depending on the particular inward state of the moving fibres, after the manner of temporary seasonings; while, at the same time, there is a habit formed of resisting the active causes (vitiating air) altogether, or of obtaining a permanent seasoning as to them.

“ The cold stage of a paroxysm is a state of direct debility, induced by the vitiated air breathed operating to subduct heat and oxygene from the body; and its termination is by the stimulus of the vitiated air being for that time worn out. The hot stage, which begins as soon as the temporary seasoning is induced, is a state of excitement brought on by the heat and oxygene now operating upon the accumulated excitability with additional force. The sweating stage is formed after the subsidence of the excessive action of the body, and the consequent enlargement of the diameters of the vessels, whereby sweat is formed by the combination of

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hydrogene

hydrogene and oxygene, and the other secretions proceed again, as usual, in the several glands.

“ The length of interval between the paroxysms depends upon the strength of habit acquired.

“ The frequency of their occurrence will be proportioned to the facility with which a temporary habit is broken or gives way.

“ The cold stage is the most dangerous ; and persons dying in it die of the direct debility induced by the vitiated atmosphere they respire.

“ The hot stage is less dangerous ; and persons who die in it expire in a state of indirect debility. But, according to circumstances, death may happen in both the cold and hot stages.

“ The sweating stage is a mere consequence of the cooling of the body, after the preceding heat and excitement of it.”

The simplicity of this theory, when put in competition with the complex doctrines of preceding physicians, at the same time that it causes our astonishment at their divergency from the fundamental laws of Nature, flatters our judgment with its own approximation ; and as it does not take the mind into the fancied reasonings of speculative hypothesis, neither does it deprive it of satisfactory reflections on facts and nature. The powers of habit and custom, though hitherto acquiesced in, in almost every action of life, have not as yet been sufficiently considered in their relation to febrile phenomena. Hence have the most useless remedies been brought into estimation, and acquired a reputation to which they had no just pretensions ; the disorder abated as soon as the constitution had become habituated to the new stimulus, and not because specifics were administered.

stered. Hence, though blood be drawn off to the amount of upwards of an hundred ounces, or calomel administered to the extent of sixteen hundred grains in the course of one febrile indisposition, the patient may get well in spite of both, as soon as the habit of resistance is formed.

On the Manner in which the Materials of Dwelling-Houses are affected by Septous Fumes and Combinations. In a Letter from Dr. SAMUEL L. MITCHILL, to Dr. EDWARD MILLER, of Dover, Delaware.

S I R,

SOME paragraphs and essays which have for some time past appeared in our newspapers, and a number of queries proposed to me by my private correspondents, concerning the production of infectious air in houses, and its concealment in sundry substances, of which the habitations of men are constructed, have determined me to collect such facts as occurred to me on that subject, and make them the matter of a letter to you. Your very obliging and friendly favour, dated at Dover, the 15th of November, merited a more speedy answer; but I am confident you will pardon my tardiness, when you consider that I have of late, like yourself, been engaged in an inquiry, tending to alleviate some of the inconveniences which result from our mode of living, especially in large and populous cities.

And here I shall take it for granted, as proved in my treatise on contagion and elsewhere, that the

air of houses, tenements, and dwelling-places, is vitiated occasionally in a very alarming and deleterious degree by the gaseous oxyd or volatilized acid produced by animal and vegetable decomposition, which have been denominated the *nitrous*. I have for some time been of opinion, that an examination of the facts upon this point is an important desideratum, both in philosophy and house-keeping.

The materials of houses may be classed under three general heads, as they consist, 1st, of Earth; 2d, of Wood; and 3d, of Paper.

1. The *earthy* materials of human habitations, whether of stone, brick, or plaster, may be considered as consisting in the main of flint, clay, and lime, the greater part of them being capable of resolution by analysis, into one or more of these elements. The flinty parts of a building, comprehending the stone and the sand mingled with the mortar, are from their nature not capable of uniting, in ordinary temperatures, with any of the common acids in any of their forms, and therefore remain pretty much in their original state as long as the house stands.

But the case is far different with the lime and clay. The operation of burning lime-stone, to render it fit for the purposes of masonry, is principally to deprive it of the carbonic acid (fixed air), with which, in its natural and crude state, it had been united. And this kind of air is so abundant in the atmosphere, that as soon as the calcined material, now converted to quicklime, is taken from the kiln, it begins to recombine in a slow and gradual progress with the fixed air, which had been expelled by the fire, and returns to the state of mild lime. In this condition, of greater or less combination with its original acid, it is worked up into
mortar,

mortar, and employed as a cement. And after its application to the purposes of brickwork or walls, lime may be considered as attracting its lost fixed air as fast as circumstances will permit; and this process may go on until a greater part of the lime is saturated. In this situation the walls may remain an indefinite duration of time, until the fixed air be expelled by some substance having a stronger attraction for lime than itself.

The habitations of men are known to afford such a substance; and the septous (nitrous) exhalations extricated in rooms, are found to displace the carbonic acid by virtue of a stronger attraction for lime, and attach themselves to that calcareous basis in the form of a nitrate of lime. There are several substances, such as the acids of sugar and of sulphur, which have a stronger affinity to lime than the nitrous acid has; but these rarely occur to disturb the common process. The plaster then by degrees becomes charged with the acid of saltpetre, attracted from the air of the chamber. This operation may go on in an old and foul house, until the whole of the lime is saturated with the septous vapour, and can take up no more.

These noxious exhalations being now no longer attracted by the lime, must either circulate through the house, or combine with some substance capable of fixing them. The *clay* of the walls is a basis with which they are disposed in the next place to join themselves. The nitrous acid, in the absence of the sulphuric (vitrolic), has the strongest attraction for clay, of any; and the combination of these two substances may thus go on as long as any particles of clay retain a capacity to attract the acid.

In the progression of things, the clay and the lime become loaded with as much septous acid as they

they can possibly absorb; and after this the pestilential gas, finding no other material to form a chemical union with, will be accumulated and diffused through the room or house, penetrating the interstices of bibulous and porous substances.

A fashion prevails in our newly-constructed and elegant houses, of making the walls of *gypsum* or plaster of Paris. This substance is a compound of lime with the sulphuric (vitriolic) acid. The sulphuric acid, as was mentioned before, possessing a stronger attraction for its calcareous basis than the nitrous possesses, cannot be altered or dislodged by the septic vapours circulating in the rooms. The lime of such walls will therefore remain for an indeterminate time, in their original condition; and the foul gases will immediately, and with greater readiness than in the case of lime-walls, vitiate the air of the house.

Walls made of lime and clay may be thus viewed as preventives of infection, while those constructed of *gypsum* have no such salutary operation. The reason of the wholesomeness of the former is, they are constantly taking the matter of contagion out of circulation, and fixing it in such a manner as to render it quite harmless. As long as the walls preserve their attractive powers, they render the air of a room fit for respiration in proportion to the quantity of gas they imbibe; when they cease to attract any more of it, the air becomes less fit for animal life, by the surplus of gas unabsorbed.

To make houses healthy then, the walls of such as have stood a long time, and have become highly nitrous, ought to be broken down, and a fresh plastering of lime applied; or if this could not be conveniently done, a white-washing, which is only a thinner coat of plaster, should be frequently performed.

formed. The septic fumes will then have something to attach themselves to, and be taken rapidly out of circulation. An easy experiment will determine whether the walls of houses suspected of being nitrous are really so or not. Take a quantity of the old plaster, pound it, and steep it in water, and add some pot-ash to the mixture; if the nitrous acid be there, it will quit its connection with the plaster, and join the pot-ash to form nitre.

The existence of nitrous acid in old grave-yards, at the same time it points out the almost sinful impropriety of burying the dead near the habitations of the living, directs us also to a remedy of the evil. If the coffin containing the corpse was filled up with lime or pot-ash, the danger of communicating infection at funerals, and the unwholesomeness of burying-grounds, would in a great degree be obviated. In like manner, the addition of the same substances to the numerous privies of crowded settlements, would have a powerful effect in preventing the ascent of deadly vapours into the air, or their penetration to cisterns and wells of water through the air.

2. As to the timber which enters into the fabric of our houses, whether it be oak, pine, cedar, mahogany, or of any other kind of wood, I know of no decisive facts evincing a *chemical union* between it and putrid vapours. But as all these materials are considerably porous, there can be no doubt of their receiving into their interstitial spaces a portion of the vapours which occupy the rooms. The quantity imbibed will probably be in proportion to their sponginess or laxity of texture; and in this ratio may the different kinds of wood be imagined capable of penetration by foul steams. In most cases of this kind, however, I apprehend
the

the contagious matter is in a very separable state, and ready on slight occasions to manifest itself in its proper and distinct form. From the readiness with which wood is penetrated by water, and from the known property of water to act as the vehicle to contagion, there can be no doubt of its entering pretty deeply into the timber of our dwellings, especially those that are not covered with a coat of paint. The covering the inside work of houses with paint, by occupying the pores of the wood, will exclude the entrance of pestilential vapours, and thus far tend to their purity and wholesomeness. It is said that ships have sometimes become so contagious, as to infect every successive crew with which they were manned. This must, in all probability, have arisen from the noxious matter inherent in their timber. And I suspect the same thing frequently happens in many ordinary houses inhabited by a succession of dirty tenants. Wood, however, would seem to admit of easy cleaning. Clear water will go a good way towards purifying it. But the infectious matter may be, without doubt, extracted from it by careful washing with a solution of *potash* in water (common lye), or by white-washing with *lime*, or even with *clay*.

3. The paper with which houses are adorned is a material of such open and spongy structure, that most fluids can easily enter into it. Oil and grease very readily insinuate themselves into paper. It very readily imbibes water, and in very considerable quantity too. Smoke tarnishes it very quick. And the colours of ancient records and books are not wholly to be ascribed to the decay of the paper and ink, but in part to the impregnation of the pages with foreign vapours. From these facts, shewing the readiness and avidity with which paper combines

combines with most liquid and aeriform bodies, there can be little doubt of its possessing a capacity, like wood and other porous substances, to receive contagion among its filaments. But as paper possesses little or no *chemical* attraction for pestilential vapours, they will not change their nature, or lay aside their peculiar qualities, by entering into the interstices of the paper, but remain in a very loose sort of connection, and exceedingly prone to detach themselves and fall forth into action. This idea is countenanced by the facts told concerning the catching of the plague by handling letters, which in these cases were very probably damp, and by aid of moisture, concentrated more of the poison within them. Yet when I reflect that the bibulous or absorbent quality of paper is the very cause why it is fit for receiving the stains, marks, spots, and colours which we impress upon it by writing and painting, it seems as if it might attach and retain a considerable share of venom, even in its dry state. Upon the whole, paper may be estimated as possessing all the inconvenience of wood, and in a much more considerable degree. Nor will this conclusion be invalidated by the consideration that the paper is covered with paint, for this layer of pigment is not mixed in *oil*, as in the paints applied to wood, but it is generally *water-colour*, and therefore greatly more open and penetrable. Notwithstanding these objections to paper, it may safely be employed in drawing-rooms and parlours without any sensible inconvenience or risk, but bed-rooms and nurseries, especially in crowded families and infectious situations, had better be furnished with lime walls, and coated over with a calcarious white-wash from time to time: when families are small and situations
neat

neat and healthy, it is wholly immaterial in which way the chambers are finished; but where the contrary is the case, it must be remembered that frequently changing the paper will scarcely prove a remedy of the inconvenience. On the subject of paper, an interesting consideration is, what danger there may be in receiving letters through the medium of the post-office, from infected places. That paper may receive and impart infection, I hold to be a settled fact: and I hold it to be no less a fact, that as there is no chemical connection between the one substance and the other, *heat alone will disengage them*. If a letter, therefore, should be received under circumstances leading to a suspicion of contagion, it should be held as near the fire, with a tongs, as possible, without burning it, and continued till it be thoroughly heated. The gas will be rarified and volatilized by the heat, and will chiefly, if not entirely, quit its lurking-place in the paper, which may be unfolded and read with safety. With great regard and attachment, I remain, very unfeignedly, yours,

SAMUEL L. MITCHILL.

New York, Jan. 20, 1796.

Dr. EDWARD MILLER.



(*On the Miscibility of Contagious Air with Water.*
In a Letter from Dr. SAMUEL L. MITCHILL to
JOHN STEVENS Esq.—Read before the Agri-
cultural Society of the State of New York, Fe-
bruary 16, 1796.

DEAR SIR,

AFTER I had satisfied myself of the composition of that particular kind of air, which is produced from substances putrefying in places where heat and moisture concur to form new combinations, my next object was to detect its particular qualities, and relations to other bodies: and I have become persuaded that in all its forms, this oxyd or acid of septon, is *readily and entirely miscible with water*. By water I do not mean the pure distilled fluid merely, but also the water of rain, snow, ponds, and marshes; and occasionally of the ocean, as well as the fluids which, though called by other names, do still consist chiefly of water, as vinegar, wine, spirits, &c.

Some of the interesting considerations which arise from this chemical attraction between watry fluids and infectious air, I shall endeavour to state to you in the order in which they rise to my recollection, in answer to your polite and instructive letter, dated at Hoboken, September 25, 1795. In dependence upon this single principle, a multitude of facts press upon the mind, and all appear equally easy of solution

1. It has been experienced in the neighbourhood of unhealthy landings, in the East and West-Indies, that ships lying a small distance off at anchor in the harbours, or at sea, have in no degree suffered

suffered by the noxious quality of the air, which was very injurious to the settlement on shore. But there, as well as on the coast of Africa, a boat's crew sent on shore, and staying the night, are very commonly seized with sickness, which very commonly destroys a number of their lives. The reason of which seems to be, that the contagious air (septous oxyd or acid) produced from putrefaction on the low and muddy banks of rivers, &c. is most concentrated at the place of its origin. Here, sailors tarrying long ashore, are obliged, in uncleared countries, to hut themselves, and sleep near the ground. From the greater accumulation of contagious air near the surface of the earth, they must be more particularly exposed to its action while lying down than when sitting up or walking about. By remaining for six or eight hours, in this manner immersed in such an atmosphere, and during the time of sleep too, one may readily understand how they either sicken on shore, or soon become unwell after getting on board. They suffer by its action in four ways: 1. By *landing* where the atmosphere is vitiated. 2. By *lying near the ground* where the noxious gas is most condensed. 3. By remaining *so long a time* within the sphere of its operation. 4. By *going to sleep*, that it may damage the body in that unguarded state. In the vicinity of all this destructive air, the ships escape for two reasons: 1. Because, if the poisonous air should reach them, it would be in a rare and dilute form. 2. Because in *passing over the water*, *so much of it would be absorbed*, that a very thin stratum would remain on the surface, not many feet, or perhaps inches in height; so that little or no inconvenience could result from it. Hence the service of cutting wood,

wood, getting water, burying the dead, trading excursions, exposure in open boats along coasts, &c. are extremely hazardous in many hot climates.

2. The experiments made at Portsmouth, Cadiz, Sardinia, Pensacola, and in Guinea, have proved that ships anchored off a little distance from places where mortal sickness rages on shore, afford a most convenient retreat for those who are well, and allow an excellent chance of recovery to such as are sick. The security of such places in unhealthy seasons has led very naturally to the idea of recommending *floating factories* to the merchants who have trading establishments on the sickly coasts of Africa, as at Cape-Coast-Castle, the mouths of the rivers Senegal, Gambia, &c. Mr. Dodge, a valetudinarian, who built *an ark*, as he called it, for himself and family, to avoid the influence of the sickly season on shore, has shewn by experiment, how well a private gentleman may be accommodated and enjoy his friends in a *floating mansion*, consisting of a sleeping-room, dining-room, apartment for servants, kitchen, coal-room, wine-cellar, &c. The principle upon which such places of abode are pronounced healthy is, that as the contagious fluid is produced ashore, or from mud in the neighbourhood, a ship or *floating habitation* cannot commonly be affected by it, on account of its *attraction for water*. The ideas mentioned in your letter are therefore rational and just, "That in seasons of infection temporary stages be framed of block-logs, and anchored off the city, at a convenient distance from the wharfs. On these suitable apartments might be erected for the reception and accommodation of the sick. And, in order to prevent, as much as possible, the accumulation of contagion, let the stages be multiplied as much as they conveniently can, and placed at proper distances

distances from each other. The most important benefits would probably result from an arrangement of this nature. By having a number of them, situated as they should be, it would be very practicable to keep them free from contagion, as they might occasionally be suffered to remain unoccupied long enough to cleanse them properly. The sick would be moved with the utmost ease and convenience, without the aggravation of their complaints by the jolting of a wheel carriage. The dead might instantly be disposed of, and the danger of spreading contagion and panic-terror, by conveying dead bodies through the streets in a hearse, would be prevented. As the removal of a sick person to an hospital of this kind would probably prove extremely salutary to himself, there would not be that reluctance either on the part of the sick person or his friends, to this necessary measure; and thus the efforts of the police to separate the sick from the well, so far from meeting with opposition, would be aided and assisted by every body. The opulent, no doubt, as a necessary precaution, would provide hospitals of this sort at their own expence. Thus situated, every comfort, aid, and convenience, might be afforded the sick, and their friends might attend them with scarcely any apprehension of danger. These *aquatic lazarettos* might also be employed in another way, probably to great advantage. The air of the city, during the hot months, is extremely injurious to young children. Vast numbers are carried off every year, during the summer season, by disorders of the bowels. It is truly astonishing what an immediate effect a removal from the foul air of the city has on infants labouring under these complaints."

3. The remarks of almost all observers agree in this point, that the aerial vapours from stagnant water are seldom mischievous, until evaporation has so far advanced as almost; or quite, to bear some part of the mud or bottom. The reason of this is evident. As long as evaporation goes briskly on, the evaporating surface is kept cool, and putrefaction of course advances but slowly. The gas extricated below mingles with the incumbent water, and for some time little or none escapes to taint the atmosphere. But as the quantity of water shrinks, and the swamp or pool dries up, the attraction of the atmosphere for the water being stronger than that of the water for the contagion, the latter is discharged from its connection, and floats about at large: the mud now grows warmer, putrefaction advances, more infected air rises, and there is less and less water to arrest its ascent: and thus the process is carried on, until the want of sufficient moisture, to promote the chemical action of bodies, puts a stop to the work, and sends forth all the gas into the atmosphere. This explanation corresponds exactly with the facts relative to its operation upon human bodies, and the consequent production of sickness.

4. Rain falling briskly in showers is found to have a beneficial effect in seasons of contagion. Some of the most infectious distempers we are acquainted with have happened in times of great drought. The suffering inhabitants of sickly places have experienced sensible relief from showers, and have generally relapsed when dry weather came on. To understand this, it may be proper to consider the infectious fluid as having risen some distance, more or less, above the ground, and the drops of rain passing through it as they fall. In a condition so favourable for union, the rain attracts the con-

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tagion, and carries it down to the earth. The sick are thereby relieved, and the healthy less exposed to danger. By and by the water evaporates, and leaves the infectious fluid by itself, to rise again, and contaminate the air. Mortality recommences. The natives of Africa are so sensible of something unhealthy mixed at times with water, that though they generally bathe once a day, they never do it in the fresh river waters, when they are overflowed by the rains; but prefer spring-water, which flows pure from the interior parts of the earth. The *first* rains which fall in Guinea are supposed to be the most unhealthy; and as evidence of their being impregnated with something more than common, they have been known to render the leather of shoes mouldy and rotten in forty-eight hours, and to stain clothes more than any other rain. Exposure to rain, and getting wet thereby, are generally believed, says Hunter, to be productive of fevers in the island of Jamaica. I have heard fishermen remark, that exposure and wetting in a shower of rain was more likely to make them sick, than the regular attendance of their seines, up to the waist or arm-pits in salt water, day after day. There is one case, however, in which a fall of rain may be productive of sickness. I shall give an example, as it occurs in Africa. During the drought, the wide rivers of that parched continent are shrunk to narrow streams, and, retiring to their channels, leave bare a large part of the surface they usually overflow. The moisture soon exhales, and leaves behind it a thick and solid crust of dried mud. When the rains fall, they penetrate and soften this parched crust, soak into the ground below, and set the whole into a putrefying state. From the surface, from which, during its dry condition, no vapours
had

had risen, now proceed noisome and noxious exhalations, which produce the most violent sickness.

5. Clothes wetted with water, and hung to windward, are the only known correctors of the violence of the *Harmattan* and *Samiel* winds. They may operate in two ways: 1. By mitigating the excessive heat of these blasts by evaporation: 2. By attaching and fixing the pestiferous matter they contain, or turning it aside by reason of its inability to pass through a coarse wetted cloth. A great variety of charms and preventives are used against infection. None of the smelling-bottles, bags, &c. for the nostrils, seem to be of any service. If any thing of this kind, applied to the nose and mouth, can do any good in pestilential states of the air, it is *a cloth or sponge wetted with pure water*, or some watery fluid, which will allow the respirable air to pass through or along it, and imbibe infection among the water inherent in the threads or pores. But such a sponge or cloth should be often washed or changed, and never suffered to dry; otherwise the collected contagion, set loose on the drying of the cloth, will be suddenly breathed in greater quantity than if no such thing had been used. It is, therefore, very questionable, whether *even this application* would, upon the whole, be of any real utility.

6. Health has long ago been considered as greatly influenced by the quality of water. The saline, earthy, metallic, and, to a considerable extent, the *aërial* qualities possessed by this fluid have been a great way investigated. From the readiness of contagious gas to combine with water, there cannot remain a doubt of its being conveyed into the stomach in large quantities, together with our drink. Though this remark will only apply to the water swallowed cold; for all that which is taken

warm in teas, soups, &c. has been deprived of the pestiferous air, by the operation of a boiling heat. It will be observed that I am now speaking of fountain, spring, and well water, as employed for domestic uses ; and not of rain water, which certainly contains it. Fresh drawn water may be generally considered clear of it ; but water that has stood long in an infected house may be considered very suspicious at best. During the extensive and mortal distemper which prevailed in the vicinity of the Salt Lake, the Seneka Lake, and on Genesee, in the autumn of 1795, there was a remarkable connection between sickly settlements and bad water. Where the water was good, few people were unwell. From the description of the uniform shore of the Chesapeak Bay, where springs of pure water are scarce, and where stagnant pools are filled with frog's spawns, musquitoes, &c. it would seem that the foulness of the water entered largely into the remitting fevers of that region : and I think the same observation applies to other tracts of country, similarly circumstanced all the world over.

7. Spittele and the fluids of the mouth consist chiefly of water, and therefore may be imagined to possess an attraction for septic and contagious gases. The matter of infection thus getting into the mouth, will almost unavoidably find its way into the stomach with the spittele, in common swallowing, or during the deglutition of the food, or be conveyed thither with the drink. By this inlet many physicians have supposed contagion to be received into the body. The opinion is probably just. A gentleman of my acquaintance received the fumes of a dysenteric evacuation ; some uneasiness at the stomach came on, with qualmsiness, which in a few hours ended in a looseness. A
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similar indisposition was brought on in another person, by receiving the effluvia at a funeral from a corrupting corpse. In both these instances, it looks as if the infectious gas was swallowed with the spittle, and thus stimulated the intestines. Nor do the alleged experiments of swallowing without detriment the poisons of small-pox, the viper, &c. in very small quantities, prove that *all other* combinations and modifications of contagion must be harmless. These experiments, though true, are, however, no further true than respects these species of venom; and I own I should like to see them repeated in larger doses. Be this matter, however, as it may, one wholesome inference results from the facts before us, that it is prudent to cleanse the mouth of all spittle, to hawk the phlegm from the throat, and throw them out frequently, and to avoid swallowing those fluids as much as possible in infected places. From the various affections of the mouth and throat, in many fevers, there can be little doubt of the contagion's having a deeper and more serious operation, than upon the mere secreted fluids. Do not aphthæ, sore throats, erythematic affections of the pharynx and gullet, arise from the local operation of this poison? This manner of accounting for these symptoms is, in my judgment, more accordant to fact and reason, than any thing I have yet met with; for as to the received notions of *eruptions* coming from the blood and inward parts, and *breaking out* upon the surface of the body, I think them a very lame part of our pathology.

8. A long continuance of fogs, with damp and drizzling weather, has been found unfavourable in sickly seasons. The gradual and slow precipitation of water from the air keeps the atmosphere so moist, that the small drops of water floating

in it enter the lungs with every inspiration, and carry a portion of contagion along with them as far into that organ as they penetrate. A damp air may thus be said to give strength to contagion, though a dry wind may spread the mischief.

9. From the same principle may be deduced an easy method of purifying infected goods, apparel, furniture, &c. the most efficacious and easy method of cleansing which, is to wash them in fair water. For this purpose the water should be *cold*, that is, of a common summer temperature, at which range of heat the contagion readily mingles with it. Linen and other things intended to be washed, should never be put immediately into *warm* or *hot* water, as the steam arising from it is found, by experience, to be offensive and dangerous. After steeping and soaking awhile in cool water, the goods may be washed out, and *afterwards* put into boiling water, if judged necessary, with safety. The application of this practice to the cases of persons actually sick, to the purification of bedding, houses, &c. where sick persons have laid or died, and to preventing the introduction of contagion from abroad, is as plain as it is extensive; and this principle is corroborated by the fact mentioned in your letter, "That Europeans residing in Constantinople, Grand Cairo, &c. have found, from long experience, that by passing every thing they receive, such as food, &c. through water, it is effectually deprived of its power of communicating contagion; or in other words, the pestilential gas, adhering to its surface, is retained by the water."

10. In many cases of sickness, especially where patients are clad in woollen, and lay on feather beds, covered by blankets, an atmosphere of contagious vapours may be imagined to surround and closely

closely invest them. The skin, especially of those not accustomed to purify it frequently by bathing, is beset by the same fluid, whose particles seem to inhere in its pores and duplicatures. The long continued immersion of the sick in shirts and sheets, rendered damp by perspiration, is thus not only a most unclean but infectious practice. The relief afforded to persons labouring under indisposition from infection, by plunging into cool water, or, as I prefer, wiping the whole body with a wetted cloth, again and again, arises not so much from the abstraction of heat as by removing the irritating and pestilent matter adhering to the surface. The purification of the whole body, by clean water, appears to me to be as necessary, in infectious maladies, as cleansing the stomach and bowels by internal remedies; and, I had like to have said, in some instances quite as beneficial. If the observance of personal cleanliness in this respect were more frequent, and chamber-baths, as among the French, more generally used as a part of bed-room furniture, contagious distempers, I am persuaded, would be far less frequent. The notion of its checking perspiration being founded on a false estimate of the animal œconomy, is too idle to listen to or to refute: and what adds further to the truth of the principle stated is, that washing the bitten part in cold water, has been recommended as very efficacious in preventing the consequences of the bite of rabid animals; and the latest West-India treatment of yellow fever confirms the utility of the boldest use of cold water, by dashing it over the head and shoulders with a bucket; or if the infected person were unable to sit up, by wrapping him from head to foot in a blanket dipped in cool salt water.

Thus,

Thus, Sir, we learn, that if the ingredients of atmospheric air, (septous and oxygenous gas,) the commonest things in nature, do sometimes get into chemical combination, and produce a pestilential or non-respirable fluid, there is also another thing, one of Nature's most plenteous productions, which seems, in its pure state, to be a sovereign preventive of a large proportion of their mischief. With deep esteem and respect, believe me to be very sincerely yours,

SAMUEL L. MITCHILL.

Plandome, Feb. 6, 1795.

JOHN STEVENS, Esq. Hoboken.

On the Decomposition of Contagious Air by Vegetation. In a Letter from Dr. SAMUEL L. MITCHILL, to ROBERT R. LIVINGSTON Esq. Chancellor of the State of New-York, and President of the Agricultural Society.—Read before the Agricultural Society of the State of New-York, February 23, 1796.

DEAR SIR,

EVER since the idea has been started of epidemic and endemic diseases being caused by liquid or aëriform compounds of the principle of *putridity*, (septon or azote,) with the principle of acidity (oxygen) in different proportions, it has appeared to me an inquiry highly worth the making, by what process in nature such vast quantities of noxious fluids are decomposed, or taken out of circulation.

circulation. In my letter to Dr. Miller, of Dover, dated January 20, 1796, I stated the facts which occurred to me, concerning the absorption of this class of fluids *by the materials of which houses are built*, particularly as respected the *lime* and *clay* of their walls; and in another communication of Feb. 6, to Mr. Stevens, of Hoboken, I pointed out the considerations then present to my mind, relative to their *miscibility with water*. By these modes of combination, some of those deleterious fluids are so damped or repressed, that their hurtful powers are quite suspended, until, by a severing of the connection they had formed with some other substance, as with lime, clay, water, &c. they break out into action again.

Besides these processes, in which the contagious airs are fixed or connected, so as to disappear for a time from circulation, there is yet another operation in nature which is capable of utterly destroying them, and resolving them into their constituent elements. This operation is **VEGETATION**.

I was induced to this opinion by the following circumstance: The scavengers and carmen of the city of New-York are in the habit of collecting from the streets large quantities of putrid mud and filth, and of laying it in heaps on vacant lots, near the skirts of the city, to be converted into manure. Near the ship-yards, on the East River, in the neighbourhood of a number of these collections of street manure, the yellow fever was very rife and destructive; and in the opinion of the most observing inhabitants, a considerable share of its violence was owing to their vapours and exhalations in the autumn of 1795. That putrid effluvia should cause sickness, is a very ancient idea; but the acquiring a precise idea of the nature of putrid effluvia, has at once such an intimate connection,
both

both with agriculture and phyfic, as to render it a matter of more than ordinary importance.

These heaps of manure appear to me to be *nitrous* soils, and capable, under proper management, of affording much nitrous acid. The effluvias from nitrous soils in Bengal (Martin's Letter in Meigs's New-Haven Gazette, May 22, 1788) and Spain, (Townsend's Travels,) are themselves nitrous and very noxious. The nitrous nature of putrid vapours appears from Mr. Thouvenel's experiments, (*Memoires de l'Académie Royale des Sciences, &c.*) and I think from Dr. Priestley's (*Exp. and Obs. vol. ii. p. 217.*)

The collections of putrefying substances in the parts of New-York more especially affected by that distemper, may be considered as so many smaller dung-heaps, and generating in like manner a vast amount of nitrous exhalations. These, when afforded sufficiently concentrated and copious, by the concurrence of sufficient heat and moisture, produce yellow fevers, bilious fevers, &c. and occasion great panic and alarm in society.

Now, these very substances that cause so much mischief and terror in cities, are sought after with great avidity by farmers, who purchase them at a high price, and use them with much advantage to fertilize their fields. The beneficial and salutary effects of this practice in husbandry, makes it look as if nitrous acid and nitrous airs were good manures, and that vegetables had the power of decomposing them: that, in short, in the œconomy of plants, there is a process by which the septon and oxygene of these infectious fluids are separated, and, while the former remains in the vegetable, as a part of its nutriment, the surplussage of the latter, after forming gum, mucus, meal, &c. and other vegetable oxyds, flies off through the

the upper surface of the leaves, in company with heat and light, in the form of vital air.

In order to establish this conclusion, it will be necessary to show, that vegetables contain the principle of putridity. The most ready way of coming at this will be by examining whether they contain ammoniac (volatile alkali). Ammoniac has the same radical (septon) with nitrous acid, but the two compounds differ from each other in this, that to form ammoniac, septon is combined with hydrogen; whereas in the composition of nitrous acid septon is connected with oxygen. If the volatile alkali then can be produced from plants, it will be a proof that the radical of the nitrous acid (septon) is an ingredient in the vegetable structure.

Pit-coal is generally considered as a substance of vegetable origin. In the treatment of coal, to procure tar from it, by Lord Dundonald's process, a large amount of volatile alkali is obtained. That whole class of vegetable bodies called funguses, or the toad-stool tribe, yields on analysis by fire the volatile alkali. The whole class of the tetradynamia, to which cabbage, mustard, horse-radish, &c. belong, are supposed to contain or to afford a large proportion of it. The glutinous part of meal, flour, or bread-corn, yields it also by distillation; and indeed most plants, urged by a strong fire in close vessels, or when converted into foot, give out the same alkaline product. The case of foot, which affords a good deal of ammoniac, is very impressive, as it seems to evince the formation of the volatile alkali, by the junction of septon with hydrogen in high temperatures, when at the same time there is incomplete combustion.

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There is an experiment of Dr. Priestley's, which shews the analogy between nitrous acid and volatile alkali. He found (Exp. and Observat. vol. ii. p. 43—44) that iron, which had long rusted in nitrous air, gave out a strong smell of volatile alkali. In this experiment, the iron attracts a part of its oxygene from the nitrous air (which always contains a quantity of water), and converts it into azotic gas and azotic oxyd. The iron likewise attracts a portion of the oxygene from the water, and sets loose a quantity of hydrogen gas. Meantime the metal grows rusty, or, in other words, is converted to an oxyd. But while this goes on, or afterwards, the component ingredients of volatile alkali are evolved, and thus the azote and hydrogen combine to form ammoniac. An experiment of Mr. Milner's is very much in point. By exposing alkaline air to substances containing oxygen, in a red heat, he produced nitrous gas (Phil. Transf. vol. lxxix. p. 300.) Here, it seems, the hydrogen of the ammoniac quitted its connection, by reason of some more powerful attraction, and afterwards its radical (azote) combined with the principle of acidity to form nitrous air. We see thus, how the azotic basis, by combining with oxygen, forms a nitrous, or with hydrogen, an alkaline product.

There is thus no difficulty in conceiving whence vegetables get their azote. Nitrous acid, and some other combinations of azote with oxygen constitute a large proportion of the fertilizing part of street manure. The powers of vegetation are capable of dissolving the connection between these two materials, and the oxygen evaporates, while the azote attaches itself to the plant, as none of its nourishing materials. It has been said that volatile

alkali exists, naturally formed, in some plants, and nitrous acid in others ; but these assertions require farther confirmation by experiment. The better opinion seems to be, that they are both formed on or by the putrefaction and distillation of such vegetable bodies as contain their constituent parts. The nitrous acid, and the analogous products, being commonly produced by common putrefaction, in ordinary summer heats ; and the volatile alkali in high ranges of artificial heat, in distillation and incineration.

It seems (Priestley's Exp. and Obs. vol. iii. p. 415.) that charcoal is, in some cases, capable of affording azotic air ; but this only happens when, after expulsion of all the air it originally contained, it has been afterwards suffered to imbibe atmospheric air. On expelling this secondary portion, there is no carbonic acid procured, but all is azotic air. Its oxygene is probably absorbed, and, as Bancroft very ingeniously conjectures, (Philosophy of Permanent Colours, &c. vol. i. p. 48.) forms the black oxyd of charcoal.

It may appear like a strange idea, that nitrous acid, and its vapours and airs, should act as manures, and assist in fertilizing land. It is, however, a certain fact, that this is the case ; and, on the rapid evaporation and absorption of these compounds, when strewed over the land, can it be explained why street manure has so little durability, and leaves so soon the fields on which it had been spread in a state of exhaustion. In like manner it becomes easy of comprehension, why spots too highly manured, as well as heaps of manure themselves, possess the fertilizing ingredient in a state too strong and condensed to support vegetable life at all. In order to operate well, and produce its greatest good effects, this manure should be tempered

pered with common earth, and by no means be spread too thick upon the ground. Unless this be attended to, the manure will corrode or poison the plants it is intended to stimulate and nourish.

Street dirt and dung thus contain nitrous acid. Vegetables absorb it, decompose it, and attach its basis, while they exhale its oxygen through their leaves into the atmosphere. This basis, in *common putrefaction*, is ready to combine with oxygen into nitrous acid again; and in *high heats* connect itself with hydrogen into volatile alkali.

That some extraordinary process of putrefaction went on during the pestilential autumn of 1795, in New-York, was evident, not only from the general luxuriance of most vegetables, but from the production of a second crop of flowers by many plants which commonly bloom but once in a season, particularly pinks, apple-trees, and cherry-trees. Notwithstanding the advantages derived to mankind from the destruction of vitiated air, and the production of vital air, by the economy of plants, the police of the city of New York, a few years ago, caused a large number of the trees growing throughout the streets to be cut down! And in the same spirit of proceeding, the committee for preventing the introduction of infectious diseases, though waited upon in person, in consequence of information solicited by them on the subject of contagion, during the pestilence of 1795, deemed the principles of the present communication not worth the hearing! Is it wonderful we are visited by plagues? With sentiments of esteem and respect, I am, Sir, your very humble servant,

SAMUEL L. MITCHILL.

New York, Feb. 20, 1796.

E X T R A C T S

FROM A

DISSERTATION ON THE OPERATION OF PESTILENTIAL
FLUIDS UPON THE LARGE INTESTINES,

TERMED BY NOSOLOGISTS,

D Y S E N T E R Y.

*By W. BAY, M. D.**The Medical Consideration of the Subject:**The Cause producing Dysentery, and the Connection
between this Disease and others shewn.*

HAVING shewn that the different gases found to exist in the alimentary canal are not the cause of dysentery, we further have seen that these, combined together according to the laws of affinity, are also incapable of exciting this diseased state of of the large intestines. We shall next shew that septon (azote), combined with the principle of acidity (oxygen), is capable, and, moreover, is the only true cause of this disease. The facts, however, shewing that an acid is the cause of dysentery, are of the indirect kind: no experiment as yet has been made to ascertain the fact; though, from the analysis of matter taken in as food producing an acid, under certain circumstances, and also excrements being used for the purpose of obtaining the acid for the formation of nitre (septe

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of pot-ash), we are led to conclude that this is the case; and the same operation which produces this acid out of the body, is found frequently to take place in the intestinal tubes. Pringle positively declares, that an acid exists in the fæces, which he calls "the feculent acid *." The septous acid, on being united with the fæces, instead of allaying the fetor, increased it, contrary to the expectation of the experimenter †. This acid is called, by him and other writers, the mineral acid ‡. Hence the increased fetor of the stools of patients in this disease; and hence also a strong proof that the acid of septon is the cause of this disease. From the analogy of the food made use of by the human species, it is found to contain the basis of this acid in a large proportion; for animal diet is much more used than vegetables among that part of the human species which suffers most from dysentery. The fæces of a man fed upon coarse bread has been found to contain a salt that detonated like nitre, when exposed to fire, as made by Homberg. Macquer §, in his remarks on Homberg's experiment, says, "that its nitrous character is by no means ambiguous: its deflagrating on live coals convinced Mr. Homberg of its being nitre. But its constantly taking fire in the retort, as often as distilled, is a sure proof that it is a nitrous salt."

* Diseases of the Army. Appendix, p. 385.

† Pringle, p. 335.

‡ The septous (nitrous) acid has, for a long time, been supposed to be a mineral production, but has lately been found to be of animal and vegetable origin, produced by putrefaction.

§ Chemistry, vol. ii. p. 372.

This also is a certain fact, and one in point, to prove that the septic acid is produced or generated in the alimentary canal; and also proves the great use of the bile in preventing those diseases, by saturating the acid with the alkali, and thereby preventing the mischief which would otherwise have been the consequence.

The septic (nitric) acid formed in the alimentary canal, in this experiment, is saturated by the mineral alkali of the bile forming the septite (nitrite) of soda. If then this acid be produced in the alimentary canal of a man fed upon bread, in what greater proportion ought it to be found in those who are fed upon lean or muscular animal matter, which contains the basis of this acid in a greater proportion than bread or corn! There is no doubt but this acid is more or less constantly formed in the intestinal tube, as proved by the experiment of Homberg; the alkali contained in the bile being in sufficient quantity to neutralize and form a septic (nitric) salt.

Massey *, in his paper on saltpetre, declares, that the strongest septic (nitric) acid is formed in the ponds and tanks, or shallow ponds of water, in the East Indies, by the spontaneous decomposition of animal and vegetable matter in those tanks or ponds. Animal substances, says Pringle †, will putrefy quicker in a confined than in a free air. Massey ‡ further asserts, that the putrefaction of manures, stinking pits, and ditches, produces the nitric acid. Having proved that an acid exists in the alimentary canal, and that this is the septic

* *Vide* Repertory of Arts and Manufactures, vol. i. p. 322.

† Diseases of the Army, p. 339.

‡ *Vide* Repertory of Arts and Manufactures, vol. i. p. 321.

(nitric) acid, I shall shew from what other sources this acid is derived, besides being generated in that canal.

Having established the fact, that an acid is formed in the intestinal canal, and that this is the septic (nitric), it will thence appear evident, how it comes to pass that this disease is produced, while no cause from without the body can be discovered, and especially in that season when a few sporadic cases are met with. It does not follow from this, that all the dysenteries arise from an internal cause; but a much greater proportion proceeds from the gaseous oxyd and volatile acid of septon (azote), taken in the body from without. In an atinosphere that is incumbered with pestilential fluids, these may affect the system of such persons as are exposed to their operation by entering in the pulmonic organs, there mixing with the blood, and exerting its influence on the heart; and as the blood passes in its routine of circulation, give to the contents of the alimentary canal a part of its deleterious quality, or may be taken into the stomach during the time of our meals, and be swallowed with the food. From their miscibility with water and fluids in general, the saliva becomes another mode of carrying it into the alimentary canal; and lastly, it is absorbed from the atmosphere by the numerous absorbing vessels spread over the whole surface of the body, in the same manner as mercury and other substances are taken up by these vessels, when applied to the skin. From these different modes in which pestilence penetrates the body, it will appear what vast quantities of the matter of contagion may be taken in, and why it happens that the patient is so frequently attacked in the space of a few hours after being exposed to such air, provided that the atmosphere
which

which he breathes be highly charged with the matter of contagion. It is owing to pestilence also, that a fever is produced, which is termed dysenteric fever: so strong is the connection of fever with dysentery, that it is reckoned a necessary symptom by writers on this disease; but a dysentery, or, at least, the affection of the large intestines, which, when united with fever, is called dysentery, may exist for a short time without fever: this, however, is only in sporadic cases, where there is no vitiated state of the atmosphere; but so quick is the absorption of this fluid from the large intestines, that it is taken into the circulation, and, operating upon the heart and arteries, produces that particular action of the sanguiferous system termed fever, almost as quick as the operation of its effect upon the alimentary canal. On the contrary, the fever may exist previous to any affection of the large intestines, provided the exciting cause be taken to the blood-vessels by the pulmonic organ, and, through means of the blood, impart it to the large intestines.

Marsh-miasmata have, for a long time, been considered as the cause of this distemper, together with putrid fumes. Let us consider what these causes are, and wherein they differ. Marsh-miasmata are the fumes arising from swampy and marshy soils, wherein are found vast quantities of frogs, newts, insects, and other animals of the like kind, together with vegetable substances, which are continually undergoing spontaneous decomposition by putrefaction: these impart to the water and soil a strong septic (nitric) tincture, which, evaporating by the heat of the season, imparts its deleterious quality to the atmosphere, where it floats, and is wafted by the wind in every direction, and affects such persons as are in its

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neighbourhood. This will appear the more certain by a fact taken from Massey *: his words are—
 “ But it must not be forgotten, that their [speaking of the East Indies] strongest nitrous (septous) earths are found at the bottom of their tanks and shallow ponds of water, which in that country are often of great extent, and in which, the water being evaporated by the heat of the sun, large quantities of fish are left to corrupt, which furnishes a mud of the *strongest nitrous* (septous) *quality*.” Hence marsh-miasmata, or the fumes arising from marshes, are nothing but the gaseous oxyd of septon (azote), and septic acid gas; and the dysentery produced by marsh-miasmata is consequently owing to the septic (nitric) quality of the water with which it is made to exhale by heat; for the evaporation of the pure water certainly would not have the same effect, as there is nothing deleterious in this fluid. Pringle† says, “ the intermitting fever, cholera, and dysentery, may as properly be called the endemics of camps as of low and *marshy* countries.”

Fumes from corrupting animal and vegetable substances are another cause capable of producing dysentery, and as such are enumerated by some authors. Let us also examine what putrid vapours are, and wherein they differ from marsh-miasmata. The product of putrefaction has been fully stated to be the formation of certain new compounds from decaying organic matter. The oxygene and septon (azote), combining during this process, form the septic (nitric) acid. “ Putrid juices and vapours are dispersed through the earth and air,

* *Vide* Repertory of Arts and Manufactures, vol. i. p. 323.

† Diseases of the Army, p. 10.

“ so that there are few earths of an absorbent kind, “ that are not in some degree nitrous*.” All these septic vapours which are enumerated, and which have been supposed to be of different kinds, are capable of producing dysentery, and are in reality similar; excepting that, in the one, this pestilential fluid is formed in low and marshy situations, while the other undergoes the same process in any situation favorable to putrefaction. Dysentery may arise from two causes; from acrimony generated in the body, and from putrid steams. “ A remarkable case occurred to me, of a person “ seized with dysentery, upon smelling of human “ blood become putrid by standing some months in “ a close phial†.” Now it is known, that the vapours of putrid blood, attracted by chalk, form calcareous nitre, and are consequently of a septic nature. How far, and what agency or qualities animal diet possesses capable of exciting this disease of the large intestines, has already been shewn. I intended to have shewn further, that it possessed, in some degree, this quality, by comparing the diseases of the inferior order of animals with those of the human species; but the diseases of the domestic, as well as those of wild animals, are as yet hidden behind the curtain of obscurity. No person has considered it of much moment to note the diseases incident to brutes, not even those of that majestic and useful animal the horse. I trust, however, that when we come to pay more attention to the diseases of the brute creation, we shall find that those who make use of such diet as contains septon,

* *Vide* Repertory of Arts and Manufactures, vol. i. p. 324, & seq.

† Pringle on the Diseases of the Army, p. 227.

whether animal or vegetable, will be found to be subject to this disease, and to all the other distempers arising from the same general cause.

*An Examination whether and in what Manner the
Dysentery and Intermittent and Remitting Fevers
are infectious.*

In considering the manner, and under what circumstances, the dysentery and intermittent and remitting fevers are infectious, it will only be necessary to shew, that if any one of them be so, it will be a necessary consequence that the others are capable of communication from one to the other, under similar circumstances, as they are all produced from the same cause, but differently modified. I shall shew, in the first place, that dysentery is infectious, as it has been a matter of great dispute, for a long time, and has been warmly contested between the two parties engaged in this speculation. I do not undertake to side with either party, but will endeavour to evince that both are wrong, and that the truth lies between.

The dysentery may or may not be infectious: this, however, depends upon circumstances. If, for instance, a patient be kept in a pestilential atmosphere, as in that of most bed-chambers in which persons sick with diseases are; if it be not frequently changed, together with the linen and sheets; and if the discharges by stool, which are fetid, be suffered to remain in the room; and whenever cleanliness is neglected; under these circumstances this disease will be infectious. But, on the contrary, where every attention is paid to cleanliness, the room frequently changed and ventilated, with a due regard to these circumstances,
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it will be found that it is not capable of being communicated from one to the other; and by this means it will be prevented from spreading to those who are necessarily obliged to be about the diseased person. The reason why this disease rages so violently in camps, and other places where a great number of persons are crowded together, is because of an inattention to cleanliness, and a proper care of removing all putrid substances from about their habitations: the disease is continually receiving additional quantities of this pestilential fluid from the exhalations from their bodies; to which may be added what is derived from their privies.

Pringle * found the camp-dysentery always contagious when it appeared in the fall.

Baron Van Swieten † relates a case where a physician, who was engaged in an examination of the stools of a dysenteric patient, fell ill with the disease himself, as also the person employed to wash the linen which had been dirtied by the stools.

Zimmerman ‡ informs us, that dysentery becomes infectious by the extreme putridity of the stools; that the most healthy subjects, and even animals, are affected with it. This author further relates an account of a dysentery which had been brought from Amsterdam to Nimiguen, and thence spread to fifty Dutch places, and carried off a great number of people. This disease, continues he, was so malignant at Bern in 1768, that thirteen thousand died with it §.

Pringle || was a man whose opportunities were very great, while in the army, to make observations

* Diseases of the Army, p. 214.

† Vol. ix. p. 357, & seq.

§ Vol. ii. p. 127.

‡ Vol. ii. p. 126.

|| Page 22.

on this disease, and was also a very nice and accurate observer; and it is on this account that I refer my reader so often to his writings. He gives an account of the state of the sick while the army was in Hannau: there were about fifteen thousand persons sick; the greatest number were affected with dysentery, by which means the air became vitiated to such a degree, that not only the rest of the patients were attacked with this disease, but also the apothecaries, nurses, and attendants, with most of the inhabitants of this village.

These facts, taken from authors the most respectable in the profession, will, I trust, be sufficient to convince every candid reader, that this disease, under the circumstances which I have mentioned, will, to a certain degree, be infectious. On the contrary, where opposite circumstances exist, this disease will be found incapable of being communicated from the one to the other, as daily experience must evince: it will not be necessary, therefore, to produce proof to corroborate this, as it is a well-known fact, that dysentery, attacking a patient whose situation in life is such that a proper attention can be had to keep his apartment clean, and every thing neat about him, rarely or never infects the attendants. What has been advanced with regard to dysentery, will hold good with the intermitting and remitting fevers. But, as it is generally supposed that the intermitting fever is not infectious, I shall produce an authority to prove that it is. Cleghorn, in his *Diseases of the Island of Minorca* *, says, “tertians have as good a right to be called infectious, as the measles or the small-pox.” That the fevers

* Page 132.

commonly remitting are also infectious, is a well-established fact. That the remitting fever, of which kind the jail is considered, is infectious, will appear from the authority of Mead †. “No-thing,” says this author, “approaches so near the first origin of the plague, as air pent up, loaded with damps, and corrupted with the filthiness that proceeds from animal bodies. Our common prisons afford us an instance of something like this, where very few escape what they call the jail fever, which is always attended with a degree of malignity.”

I am aware of the arguments which those who do not believe these diseases capable of being communicated from the sick to those who are in a state of health, will use to maintain the position, that they are either epidemical or endemical from the pestilential state of the atmosphere; and that every person will be more or less liable to be affected with those diseases from this cause. I grant this to be the case generally. But will not the persons who attend and nurse the sick be more liable to be affected than those who are not conversant with them? I answer, yes, most certainly; and I am supported by the authority of Cleghorn and Fordyce, who both declare this to be the case; and this is easily reconciled; for there is always exhaling from the sick infectious effluvia, which in general may not be sufficient to produce the diseases; yet we are warranted to believe, that they may be sometimes capable of exciting these unhealthy states of the system.

† Mead on the Plague, 110, 111.

The Method of Prevention.

HAVING completed the consideration of the physiological, and entered upon the pathological parts of the subject, it yet remains incumbent on me to consider the method of prevention and cure. The prevention of diseases is as much the care of the physician, as the cure of them, and requires a greater degree of penetration and discernment, as a perfect knowledge of the causes, and also the circumstances necessary to produce them, is requisite. The cure, in some cases, may be made from a mechanical knowledge of medicine. In order, however, to prevent this disease, the following indications ought to be observed.

1st. The patient should avoid all septic aliment, such as the whole class of animal substances, except their oils and fats, in that season of the year in which the disease is most prevalent, and substitute a vegetable diet. Lean and muscular animal substances, as has been shewn, contain a large proportion of the basis of pestilential fluids, which, combined with oxygene, have been proved to be the cause of dysentery; and, on the contrary, that vegetables contain it in a less proportion: hence, then, it follows, that vegetable diet is to be preferred to that of animal. The atmosphere is impregnated with this deleterious fluid, which, being taken into the body by means of the stomach, lungs, and absorbing vessels, will, if there be no addition from within, produce only a mild affection; but if, through septic aliment, there be an addition from within, the disease will be aggravated, and instead of a mild dysentery, a more violent

violent affection will ensue: from which the necessity of prohibiting septic food must be evident.

2d. The next consideration which presents itself to our view, is the avoiding costiveness. This has been universally considered by Hippocrates, Galen, and their followers down to the present time, to be an important consideration in preventing diseases in general; and in no case will it be found more necessary than in the present. The faeces, by remaining stagnant in the alimentary canal, and undergoing putrefaction, will produce the pestilential fluid, or the cause of this distemper of the large intestines, as has been proved in a former part of this dissertation; and by this means, if there be no addition of septic (nitric) acid from the atmosphere, a sporadic dysentery will be produced. Costiveness also weakens the body, and predisposes it to the operation of contagion; by which means it lessens the power of the system to become habituated or seasoned to the influence of the stimulus of pestilence: it also indicates an interruption in the process of digestion. It will appear evident, that this state of the bowels ought to be attended to, from this consideration, that the faeces being suffered to undergo putrefaction in the intestinal tube, the matter of contagion will be formed there: this being united with a pestilential state of the atmosphere, the patient will be more liable to be affected by it than those who receive no addition from within; and if the pestilential state of the atmosphere should be so considerable as to be sufficient to produce this disease, it certainly will be aggravated by such addition.

3d, and lastly. The patient should avoid a pestilential air, which, according to the state of impregnation of the atmosphere, will be found more or less liable to affect the alimentary canal;
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may, such situations should be avoided as the only certainty of escaping the disease. Although some constitutions are capable of remaining in tainted atmospheres without being taken sick, owing to the system becoming habituated to the action of this stimulus; yet this is no certain criterion to form a judgment, whether or no a person will escape the operation of this pestilential fluid: this, however, is certain, and for the reasons before stated, that persons abstaining from animal diet will be more likely to escape infection under similar circumstances, than those who make a free use of it. For the same reason it will appear, that of two persons, under a similarity of circumstances and situation, the one using animal food, the other vegetable; the former will be more severely attacked by this disease than the latter. If proper attention be paid to these circumstances, they will generally prove sufficient to prevent any affection of the large intestines: it will, however, frequently happen, from the particular circumstances of some inhabitants, that these observations cannot be complied with, and they will be attacked with this malady: they will therefore become the objects of cure.

The Method of Cure.

IN order to make a cure, the physician must administer such remedies as will prevent the disease, or exciting cause, from wearing out the excitability of the part affected. When I speak of curing the disease, I would not wish to be understood as meaning to prescribe a specific; for we have no such medicine; and it is a doubt whether any such remedy has ever cut short a disease: I therefore
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mean such remedies as will lessen the operation of the cause, in order that the body may not sink under its deleterious operation; and in so lessening this fluid, the body will, with greater certainty, become habituated to this particular action of the exciting causes; particularly as the disease will run its full time before a person can recover from any attack. It is upon this principle that all diseases are said to be cured, though the recovery has been ascribed to certain remedies, and it is upon this principle that we can reconcile and explain the success with which some opposite remedies have been in vogue, in curing diseases. Physicians may be equally successful in certain mild diseases, although they make use of the most opposite remedies. The constitution of man possesses the power of becoming habituated to the action of certain substances which are deadly in their operation beyond conception. We find that the most inveterate poisons may be taken with impunity, and little or no inconvenience be experienced from them, provided a certain quantity be taken at first, and gradually increased. If a person, who is not accustomed to poisonous matter, take a dose less than one which an habituated person may take, immediate death will be the consequence. This power to take large quantities of poisons is sufficiently verified in the single instance of persons who are capable of taking a wine-glass full of laudanum without experiencing any other effect than a species of intoxication; while, on the contrary, a person unaccustomed to its stimulus would die almost instantly. Who is that presumptuous physician that would pretend to cure the small-pox? I believe none will be found who has hardiness enough to attempt any such thing. The only circumstance to which the physician has to

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attend,

attend, is to prevent the variolous poison from producing indirect debility: the constitution will become gradually habituated; and in this manner the patient gets well. The same thing takes place in the measles; and I have not the least doubt that every disease has a certain period to which it will run in spite of all the healing art can do, and at which time the body will become habituated to the stimulus producing the disease. There are, however, some constitutions which require a longer time to become familiarized than others; and when they are incapable of becoming habituated, death must ensue; as it must also when the degree of the exciting cause is very considerable, and receiving continual additions.

The indications of cure are three: 1st. To remove septic and feculent matter from the alimentary canal. 2d. To correct the vitiated state of the atmosphere, or to remove from it. 3d. To allay the inflammation, and the other injuries which the alimentary canal may have sustained by the original cause of the disease, and the remedies made use of to effect a cure.

1st. Great care should be had to evacuate the contents of the intestines freely, in order to remove any septic or feculent matter which may be found there. The reason for this precaution is obvious, as these substances, if left in the alimentary canal, would act as a fountain to foster or generate the original or exciting cause, and add to the violence of the disease. The remedies which I shall recommend for this purpose are, the carbonate of pot-ash (salt of wormwood), acetite of pot-ash (regenerated tartar), sulphite of pot-ash (vitriolated tartar), tartrate of pot-ash (soluble tartar), tartrate of soda (Rochelle salt). These salts are decomposed by the septic (nitric) acid, which coming in contact with

with them; the alkaline bases will part with the acids with which they are combined, and unite with the septic according to the laws of attraction, and form with them septites. By this means the cause of the disease will be removed, and the patient restored to his former state of health. The muriate of soda (common sea salt), with the vegetable acids, is also highly recommended in this disease. Wright * observes, that marine salt dissolved in any of the vegetable acids, operated as a charm in dysenteries, in the island of Jamaica, when all the other remedies which have been celebrated in curing this disease had failed.

This is corroborated by the experience of others. This salt, like all the others, owes its good effects to the alkali with which the marine acid is combined, the septic (nitric) acid being stronger, and having a more powerful attraction for soda, than the muriatic: the soda quits its combination with its former acid, and combines with the septic (nitric), forming a septite of soda.

The vegetable fixed alkali (carbonate of pot-ash) will be found to be a very efficacious remedy in this disease, as appears from its effects in the two cases annexed to this paper, where it has had the desired effect, while all the other remedies generally employed had failed. The dose which may be given with safety is, four grains dissolved in half an ounce of water, and repeated every two or three hours, until natural stools are evacuated. If jalap or rhubarb be combined with vegetable fixed alkali (carbonate of pot-ash), its operation will be greatly assisted; for while the pot-ash attracts the septic

* Medical Commentaries; Philadelphia edition, vol. vi. p. 121.

(nitric) acid, and destroys its deleterious quality, the jalap or rhubarb will tend to remove the matter contained in the alimentary canal. The oleum ricini and the cerated glass of antimony have also been found to be of service in removing the contents of the intestines. After having evacuated the intestines, we are next to endeavour to relieve our patient of the tenesmus: this will be answered by making use of the starch enema with the tincture of opium; a mucilage made of any of the gums, as the gum arabic, a decoction of marsh-mallows, with laudanum, or an oleaginous mixture with anodynes. While the tincture of opium tends to take off that extreme irritability of the intestines, the starch forms a sheath for them, which defends them against their acrimonious contents, and in this manner supplies the place of the mucus, which is destroyed by the septic acid.

While we are turning our attention to the alimentary canal, we should not neglect to cleanse the body externally, in order to remove all septic matter from its surface, which, if neglected, would, in a great measure, retard the recovery of the patient. For this purpose I would recommend the cold bath, which, while it cleanses the body, will, at the same time, subduct the stimulus of heat, and make the patient more comfortable, and also produce a diaphoresis.

2d. After having cleared the alimentary canal of the pestilential matter existing there, the next circumstance which requires the attention of the physician, is the state of the atmosphere surrounding the patient. The vitiated state of it is to be corrected; or, if we should not succeed, we are to remove the patient. The chamber of the sick ought to be perfectly ventilated, and frequently changed; and care should be taken, immediately

after the removal of the sick, to clean the floors with alkaline ley, and white-wash the walls with lime. By this means the pestilential matter will unite with the lime and alkali, and form septites, and thus be taken out of circulation.

Sprinkling cloths with vinegar would supply a grateful odour to the sick. The food of the patient must not be cooked in an impure atmosphere; for pestilential fluids have a great tendency to mix with water; neither ought the drinks of the patient to be suffered to remain in vitiated air; for, through the neglect of these precautions, we may unexpectedly find the disease increased, without being able to account for it. The frequent changing of the bed-clothes will also greatly contribute to the recovery of the patient, as it is a notorious fact, that they are capable of imbibing large quantities of the matter of contagion, especially woollens, cottons, and feather-beds; and further, they are very apt to communicate it to persons who are in health: we cannot, therefore, be too careful and attentive to these circumstances. The linen of the sick ought also to be very frequently changed, as much of the success of our practice depends upon a due attention to cleanliness.

I cannot, in this place, help noticing a practice which commonly proves too fatal to the sick, but which has been strenuously recommended by certain practitioners, in order to purify the atmosphere:—a method which must appear to every intelligent and candid observer as highly reprehensible; and, instead of purifying the atmosphere, must make it less pure than before:—a practice which must be considered to be injudicious and improper in the extreme, and can only be the result of ignorance and prejudice. The practice I allude to is the burning of certain combustible substances, as tar

and sulphur ; nay, any attempt to purify the air by combustible materials ought to be avoided, as they act powerfully in vitiating the atmosphere ; and upon this principle ; during combustion, oxygene (vital air), so necessary to support flame, is absorbed, by which means that vital fluid which already exists in too small a proportion in the atmosphere, is destroyed, and thus the air necessary for animal existence will be entirely expelled, or at least so much diminished as to endanger the life of the patient.

If, however, we should not succeed in purifying the atmosphere, we should remove the sick out of it into that which is uncontaminated by this pestilential poison. This precaution we ought never to omit, whenever the situation is such as to render it practicable. This will greatly accelerate the recovery of the sick, as every addition from without must greatly retard the cure, and most generally will wear out the constitution, and cause the death of the patient ; for, during the continuance of the patient in such an atmosphere, the power of becoming habituated to the disease may not always be sufficient to counteract the continual accumulation of the pestilential stimulus.

3d. In the last place, we are to turn our attention to allay the inflammation, and other injuries which the alimentary canal may have sustained, by the original cause of the disease and the remedies made use of in order to effect a cure. For this purpose bleeding will be necessary, not only to allay the inflammation, but also to prevent the matter of infection from wearing out the excitability of the heart, and producing indirect debility, and its frequent consequence, death. That there is infectious matter in the sanguiferous system, is certain, from the fever which attends this disease. While we administer

administer cathartics to the alimentary canal, we should not neglect to purge the blood-vessels, and subduct the stimulus or infectious matter from the blood; the bleedings should be small and frequent; but this, in a great measure, must depend upon the judgment of the practitioner, as circumstances should require. We should not be deterred from taking a sufficient quantity on the approach of syncope, as no bad consequence will arise from this circumstance; nor should we be prevented from repeating it from the disease or fever not yielding to the second or third bleeding, nor, in the first instance, from the smallness or weakness of the pulse, as it will rise after or during bleeding. In this manner the blood-vessels will be emptied or cleared of the matter of infection; when the patient should be directed to take nourishing soups. In order to show more clearly how bleeding will lessen the quantity of pestilence contained in the blood-vessels, I shall explain in numericals. Suppose, for instance, the blood contains pestilential matter equal to 100, and by bleeding you draw off a portion equal to 20, it is evident that there will remain infectious matter equal to 80: if, therefore, the operation be repeated two or three times, you will reduce it to less than half its original quantity. This is not the only advantage derived from bleeding: it is a powerful sudorific, which is also of consequence to be attended to, as the remedies commonly administered for this purpose are too stimulant: the most of them contain opium, and therefore ill accord with the inflammation in the intestines. The injuries which the alimentary canal has sustained from the original cause of the disease and the remedies, ought also to be attended to. It will perhaps be asked, what injury the remedies do to the intestinal canal? or how it can be

possible that remedies can do that injury, and yet the patient get well? The medicines made use of for this purpose must certainly have some effect upon the guts, or otherwise they would not be capable of producing any change whatever, but be inert, which is not the fact. They must operate from some stimulant quality inherent in them; and every thing that stimulates must leave an effect after the operation of such stimulus; but still the good effect which they produce greatly overbalances the situation in which they leave those parts, which is much less than the original cause, and from which the patient will sooner and very readily be relieved by the efforts of Nature alone. To shew this, I shall suppose the operation of the pestilential fluid to be as 100, and the effect of the remedy as 10: now, if by giving the remedy, we remove the original cause, which is as 100, there will remain a diseased state of 10 in the alimentary canal; consequently the lesser evil will be preferred to the greater. To repair these injuries, mild tonics, and a rich and nourishing diet, together with pure air and gentle exercise, will be sufficient.

The diet for the use of the patient should be rich soups, milk, and vegetables: the lean part of animals ought to be prohibited during the whole period of the disease; and even when the health of the person is restored it ought to be used very sparingly, as it would be liable, from the powers of digestion being weakened, to bring on a relapse: it could not be completely digested; and putrefaction would take place, and regenerate the cause of sickness, more especially if the disease occurred in that season when the atmosphere is more or less charged with pestilential vapours.

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The tonics ought to be mild, as the excitability must be reduced to the healthy standard, otherwise we should endanger the patient by producing another disease; for the excess of stimulus destroying the excitability, or reducing it beneath the healthy point, will occasion a disease as dangerous as the original. An infusion of the chamomile flowers has been much esteemed: if to this infusion a small proportion of the carbonate of pot-ash (the salt of wormwood) be added, it will be greatly aided in its operation; for this reason the debilitated state of the stomach and intestines, from the operation of the septic compounds, will incapacitate them from performing their functions completely; consequently a small portion of the septic acid will perhaps be formed, and endanger a relapse. Now, while the tonic quality of the infusion tends to restore the system to its healthy point, the alkali will assist it, by destroying the septic compounds which may be formed, and thus tend to prevent a second attack, and insure a more speedy recovery. The colombo, the cinchona, and all the other mild tonics, may be used; but the particulars of them must be left to the prescriber and the particular circumstances of the patient.

The Theory of Pestilential Fluid.

THE theory of contagion is simply this, that septon (nitrogene) in combination with oxygene (the principle of acidity) forms a compound which, when applied to the bodies of animals, will produce the varieties of fevers and other infectious

diseases, according to the parts to which it is applied; and these will be inveterate or mild, according to the degree of combination of these substances. In the first degree, it will form the gaseous oxyd of septon; in the second, the septic gas; in the third, the septous acid; in the fourth, the septic acid; and in the fifth degree, the oxygenated septic acid.

The ingredients of this matter of contagion constitute the chief part of our atmosphere; they exist in the following proportions: septous gas, 72 parts of an hundred, and 28 parts of oxygène. Hydrogene gas and carbonic acid gas are sometimes found existing in the atmosphere; but they are only considered accidental, and not necessary. The particles of these fluids float about, in ordinary circumstances, through each other, by means of the wind, which are necessary to keep them mixed, in like manner as oil is kept mixed in water by a continual agitation; but no sooner is the oil and water suffered to be at rest, than they separate; and the same would take place with the component parts of the atmosphere, were they not kept in continual motion by the winds, as they differ in many degrees of specific gravity. But these have, under certain circumstances, attractive powers strong enough to make them frequently combine. The principal cause which prevents their combination, after they have acquired an aërial form, is the greater affinity they have for caloric or the matter of heat (which gives them the properties of an elastic fluid) than for each other. Whenever, therefore, septon (nitrogène or basis of azotic air) and oxygène (basis of vital air) can come together, without assuming the aërial form, they will combine together according to the laws of chemical affinities, and constitute,

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in this form, pestilential fluids, varying in proportion to the degree of oxygenation, and possessing qualities very different from either of their elementary or component parts.

This combination is produced by the particles of the one becoming intimately and chemically blended with those of the other: this will take place in every circumstance where they can come in contact with each other before their union with caloric, or the matter of heat. This chemical union is most generally the product of the putrefaction of the greater part of animal substances, except their fat; and of vegetables which contain septon, such as wheat, coffee, &c. Rain-water is found to contain a considerable proportion of the septic acid, as also the wells and reservoirs of hot climates. It is also found to exist in the plaistering and walls of old houses, especially if the inhabitants have lived in an unclean manner, and the house stood in the neighbourhood of foul and corrupted vapours. Jails are also found to have the lime saturated with septic acid. This is verified by the following description of the late keeper of the state-prison of Olmutz, where La Fayette was confined: “ Besides many other inconveniences, “ the situation of the dungeon is rendered more “ unwholesome by the vicinity of the barracks on “ one side, and the common necessary-house on “ the other, the damp of which is so great as to “ cause the walls to be covered with saltpetre *. “ The *stagnated water* of the Morawa, close to “ them, not only breeds innumerable swarms of “ insects, and thick vapours, but that branch

* The sal muralis of Walker, terrene nitre of Cronstedt, and nitre calcaire of Morveau.

“ which

“ which passes along the walls, under their windows, being, by its depth, favourable to carry off the filth, &c. of the city, has become its common sewer; to which circumstances is attributed the reputed insalubrity of the town. Add to this, that the nearest buildings are, on one side, the military, and on the other, the city hospitals*.”

Before I leave the subject of pestilential fluids, I shall make a few remarks upon the similarity of these sentiments with several passages in Darwin's *Zoonomia*. In treating of the *febris a pure clauso* †, he has the following sentence: “ In this fever, the matter not having been exposed to the air, has not acquired oxygenation; in which a new acid, or some other noxious property, is produced, which acts *like contagion* on the constitution, inducing fever-fits, called hectic fever, which terminate in sweats or diarrhœa; where, as, as the matter in the closed abscess is either not absorbed, or does not so affect the circulation as to produce diurnal or hectic fever-fits; but the stimulus of the abscess excites so much sensation as to induce pestilential pyrexia, or inflammatory fever, without such marked remissions.”—“ But in the pulmonary ‡ ulcers, which cannot protect themselves from the air by forming a scab, the uncombined oxygene of the atmosphere unites with the purulent matter, converting it to a *contagious ichor*, which, by *infection*, not by *erosion*, enlarges the ulcers,

* Vide account published in M'Lean and Lang's paper, Feb. 15, 1797.

† *Zoonomia*, vol. ii. Class II. 1. 6.

‡ Vol. ii. p. 288.

“as in the itch and tinea, &c.”—“Another *
“proof of the stimulant quality of oxygene ap-
“pears from the increased acrimony which the
“matter of a common abscess possesses, after it
“has been exposed to the air of the atmosphere,
“but not before; and probably all other conta-
“gious matters owe *their fever-producing property*
“*to having been converted into acids by their union*
“*with oxygene.*”—“The matter† deposited in
“large abscesses does not occasion hectic fever,
“till it has become oxygenated by being exposed
“to the open air, or to the air through a moist
“membrane: the same seems to happen to other
“kinds of matter, which produce fever, or which
“occasion spreading ulcers, and are thence termed
“contagious.”

His *febris a pure aerato* ‡ is ascribed to the union
of the oxygenous portion of the atmosphere with
the effused pus, converting it to *a weaker kind of*
contagious matter. Doubtless, in the cases alluded
to by Darwin, the *oxygene* combines with *septon*
(nitrogene), and the acid formed is the *septic*
(*nitric*) acid. This is the product which Mitchill
supposes to be occasionally formed from the ma-
terials of some articles of diet, in the alimentary
canal, and to cause certain nauseas, vomitings,
gastrites, diarrhœas, choleras, dysenteries, &c. and
thence absorbed by the lacteals, or from the
surrounding air, which he considers as poisoned
by it, by exhalations from putrid substances in
pestilential seasons, by the lymphatics of the skin
and lungs, and excites various commotions in the
heart and sanguiferous system, assuming the form

* Zoonomia, vol. ii. p. 689. † Page 729. ‡ Page 285.
of

of continued, remitting, and intermitting fevers. What is particularly to be noticed is, that it does not appear that this coincidence of opinion between our *Professor of chemistry* and the *Philosopher of Derby*, is the result of any communication of ideas between them on the subject; Dr. Darwin having indeed published his book before Dr. Mitchill wrote, but Dr. Mitchill having gone deeply into the subject, and delivered his doctrine of pestilential fluids in his lectures, the winter of 1795-6, before the volume, whence the above extracts are taken, had reached America.

Effects of Pestilential Fluids (Combination of Septon with Oxygene) upon the Sanguiferous System of Animals, particularly the Human Species. In a Letter from Mr. MITCHILL to JONATHAN N. HAVENS, Esq. Representative from the State of New-York in the Congress of the United States.

You write me, in your letter from Shelter Island, of the 20th of July 1796, "that you have been reading Saltonstall's Dissertation on Pestilential Fluids with attention, and that it has raised your curiosity upon that subject." To gratify this further, you request me to send you the publication I made about a year ago on contagion, as you have not yet read that performance. It is out of print, and I have for some time not known where to get a single copy. As it may, however, one day fall into your hands, I shall, in my present answer to your late favour, consider
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the subject in a manner different from any thing contained in that tract.

If I have not deceived myself, there are facts enough stated there and elsewhere, (my letter to Miller,) to shew that seprous and septic vapours (combination of septon, or azote, with oxygene) issuing from organized substances, in certain states of putrescent decay, in the open air, rise and contaminate the atmosphere near the earth, and in the habitations of men; and, unless I am greatly mistaken, there is a sufficiency of facts to persuade us, that similar products are formed at times in the human stomach; when, on a suspension of the concoctive process, a load of *beef*, half tainted and half raw when eaten, corrupts in a British or American stomach, and causes gastritis and black-vomiting. I mention *beef particularly*, because, in Rammazzini's account of the contagious epidemic which infected the neat cattle throughout almost the whole of the Venetian dominions in 1711, (Opera. Med. & Ph. p. 460.) we are informed, that, on some former occasion, there took place disputes between the butchers and inhabitants, both at Venice and Padua, about the quality of the beef brought to market. It seems, many of the people who ate the beef became sick, and died of dysentery. The blame of this was thrown upon the butchers, who were charged of buying up sickly cattle in Hungary, and selling their dis-tempered flesh to the people. This matter being referred to the physicians, they gave an opinion in favour of the butchers. Whence it would seem that complaints of the unhealthy quality of this sort of animal food are by no means new and unprecedented.

Pestilential fluids, thus exhaling from the surface of the earth, may completely surround the human

human body, and be applied to the whole cuticular and pulmonary surface, as well as to the entire mouth and nostrils: and the like productions, generated in the alimentary canal from corrupted food, may be spread all along the intestinal tube, so that the internal surface from the gullet to the anus, may be at times partially or entirely disordered by them.

If such noxious substances are applied, both externally and internally, to so large a surface, it might be expected they would have something more than a local operation, and extend their influence beyond the mere part which they touched. These exhalations acting *externally* in their strong state, may instantly kill, by stopping respiration; may cause, by their caustic quality, ulcers to form, blisters to rise, and mortifications to spread along the skin; and they may inflame the nose, throat, and eyes, and cause pimples and spots of various shapes and hues to appear; or, by *internal* agency, similar fluids may excite an erythematic or erysipelatous inflammation in the stomach and intestines, inducing gastritis, diarrhœa, and dysentery, with destruction of the lining of the guts, effusion of blood from the corroded vessels, and ulcerations, gangrene, and sphacelus, from their caustic sharpness. But these are not all the effects which such deleterious fluids are capable of working on the living body. Can it possibly happen, that pestilential fluids shall come in contact with the lungs, skin, and intestines, whose surfaces are thickly beset with absorbent vessels, and that their noxious matters shall remain around the orifices of those inhaling tubes for a very long time, and yet no atom or particle of them be taken in? Will not a portion of them be sucked up by the lacteals from the intestines, and by the lymphatics from the
other

other exposed surfaces of the body, and through their channels be conveyed into the mass of blood? Will not the blood, on receiving these foreign materials, assume new qualities, and, as it travels the round of circulation, carry with it the mischief and venom to the brain and nervous system? Let us examine these questions.

First, let the appearances be observed which blood exhibits in the vessels of those who are dead of pestilential distempers. The dissections of this class, mentioned by Lieutaud, (which I shall take because the book lies before me on the table,) are all declared to be attended with changes of the blood of a remarkable nature—blood taken away by venesection being in a short time liable to corrupt in *putrid* fevers (*Precis de la Medicine*, vol. i. p. 45.); in the hepatic veins of *ardent* fevers being black, and having a resemblance to pitch (p. 56.); in *malignant* fevers sometimes appearing to be in a state of dissolution, and at others very thick, and formed into polypus concretions (p. 70.); the heart and vessels in the *plague* very much enlarged, and filled with black and grumous blood (p. 86.). In those who die in the cold fit of *intermittent* fevers, the blood is black and thick, distending the lungs, heart, and large vessels (p. 96.), the vena portæ being prodigiously distended.

Secondly, it will be next proper to see what are the effects of septic and septic airs, when injected, artificially, directly into the blood-vessels of living animals.

Luzuriaga, one of the king of Spain's philosophical pensioners, injected septic gas (azotic air) into the jugular vein of a dog. The animal almost instantly expired; and on opening the thorax, the blood in both ventricles and auricles of the heart was found thick and dark-coloured, though less so
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in the left than the right; which latter was full of polypi: the vis insita of the muscles, and the irritability of the heart, were destroyed.

He also injected septic gas (nitrous air) into the jugular vein of another dog: on examination after death, the blood in the auricles and ventricles was of a darkish purple, or blackish hue; polypi were found in the right cavities; and blood a shade or two lighter in the left. The irritability of the heart was very much diminished, and the lungs considerably damaged by the air injected. (*Tentamen Medicum*, &c. Exp. 4 and 6.

Thirdly, there will likewise be a propriety in examining what changes septic gas makes upon blood drawn out of the vessels. *Arterious* blood (*Ibid.* Exp. 12.) running into a vessel filled with septic gas, quickly coagulated; a greenish coat formed upon the surface; the crassamentum towards the bottom was dark-coloured and less green; the quantity of serum was small and greenish. *Venous* blood, treated in like manner, exhibited a large quantity of dark-coloured serum, without any greenness.

From the comparison of the blood in these dissections with the blood treated with the septic and septic gases, it is evident there is in both cases *a loss of floridity, an acquisition of a dark or black hue and spissitude, tending to the formation of grumes or polypi*; and as far as inquiry has been made, I think we are warranted in concluding, that such changes in the blood take place more or less in *all distempers springing from pestilential miasmata, or contagious vapours*. A question, however, arises, whether the altered condition of blood in febrile disorders is owing to the same cause which brought on a similar state of it in Luzuriaga's experiments? or rather, whether septic (nitrous) compounds do
not,

not sometimes insinuate themselves into the blood-vessels, and bring on the above-recited state of the vital fluids? I am inclined to think this is the case. And though I am far from believing that septous and septic compounds, in their proper form of gases, can, by any natural process, get into the circulating system of living animals, yet it appears to me highly probable, that the septous and septic acids may be occasionally inhaled, in conjunction with other fluids, both by the lacteals and lymphatics, and thus enter into the sanguiferous tubes.

I shall doubtless be considered a favorer of the humoral pathology, from my dwelling upon the morbid conditions of the fluids and humours. I own that I am. A fashion has too long prevailed of referring every thing immediately to the solids; and this has been carried so far, that febrile diseases in particular have been deemed original affections of the nervous system. This doctrine of the nerves and solids has been carried a great deal too far by Cullen, Brown, Milman, and their followers, who, in their zeal for supporting *the vital excitement of the moving fibre*, have overlooked half the facts which appertain to the subject. This is so much the case, that there is a certain symptom occurring sometimes in the course of malignant diseases, and not noticed by either of those writers, the true interpretation whereof affords a guiding light through the devious and obscure region I have undertaken to explore.

1st. Among the tokens of putrescent fever, as it occurs in the island of Jamaica, especially when putrescent tendency is communicated from the *primæ viæ* to the rest of the body, there frequently comes on, towards the end of the distemper, an uncommonly fine and delicate bloom of the complexion.

plexion (Jackson's Treatise, p. 101.), while the edges of the tongue are clear and of a beautiful red in their colour, and the lips smooth and of a cherry-like appearance: when this beautiful blooming colour prevails, which is not natural to the patient, there is always reason to suspect danger (p. 113.). It is presumable that, in such cases, a highly-oxygenated septic acid is formed in the alimentary canal, which is absorbed by the lacteals with the chyle, and carried into the blood-vessels, where, instead of attracting oxygene from the vital fluid, as septic gas does, it will give out a portion of its own oxygene to the blood, and impart to it a remarkable and unusual degree of redness. This property, which it possesses in common with vegetable and other acids, may thus heighten the colour of the blood, which at the same time, from its tendency to lessen the living energy of the heart by excessive stimulation, may be very operative in undermining the animal fabric, which it thus destroys, while it beautifies. We have seen, in the experiments related, how *nitrous* (septic) gas attracted oxygene from the blood. The same thing takes place when it meets with *vital air*. The two airs instantly combine, and a quantity of heat is evolved. The product of their union is *nitrous acid*, as De la Metherie himself allows (*Essai Analytique sur l'Air*, &c. p. 376.). This author, who is no friend to the new Nomenclature, admits, however, with Thouvenel, that *nitrous acid* in the saltpetre works, is produced by the concurrence of pure air with *putrid* vapours. What then is putrid vapour but nitrous gas? Putrefaction *sometimes* goes on among the inanimate animal contents of the alimentary canal. Putrid vapour then must be formed. If this be nitrous (septic) gas, it will attract oxygene from the neighbouring substances, and

and be instantly converted to nitrous or nitric acid; and if this meet with no neutralizer in the bile or alkaline matter in the *primæ viæ*, it may inflame the stomach and intestines, be absorbed, oxygenate the blood, &c. &c. I think further, some pestilential matter vitiates the blood.

2d. Because children born of mothers sick with the plague have been known to bring with them from the womb evident marks of pestilential infection (Russet, p. 95.). The fetus can scarcely be supposed to have bred the distemper within itself; the matter of mischief was therefore most probably received from the placental vessels of the mother; although there is no direct communication of maternal and fetal tubes, still the connection may be imagined intimate enough to allow somewhat of the taint of the mother's blood to pass through to the child. Or, if this explanation be deemed unsatisfactory, there is only one other possible mode of explanation, and that is, through the medium of the liquor amnii, which must, in that case, have become contaminated with the pestilential venom passing unchanged through the secretory organs. In either case the point I am looking at is clear, viz. that the blood of the mother has something noxious in it.

3d. Because, whether the maternal blood be enough vitiated to infect the fœtus or not, yet women, in whatever stage of pregnancy, when distempered with plague, seldom escape abortion, and many of them perish, even when the loss of blood from miscarriage is not considerable (Russet, p. 95.). As the lungs of the mother have to provide oxygenated blood for the constitution of her yet unbreathing child, as well as for her own, it is easy to conceive wherefore the dark-coloured, under-oxygenated, pestiferous blood of the former should be

unable to restore the vital stimulus in due quantity to the effete and exhausted blood of the latter: for want of this needful and exciting ingredient, the umbilical vein carries back to the young animal a mass of blood quite sluggish and inactive. The immature fetus of course dies, and drops from the uterus, like unripe vegetable fruit from its branch.

4th. Because obstructions and swellings of the *inguinal* and *axillary glands* often accompany a pestilential condition of the air. The venom is, in all probability, imbibed by the absorbents, and carried with their other contents into the mass of blood. Buboes and glandular tumours thus occur only in comparatively a few cases, when the pestilential matter sticks by the way, and cannot find its passage freely along the opening into the left subclavian vein. I cannot help thinking the tumors of these glands, in pestilential cases, are as fair evidence of the poison absorbed, as in instances of an enlargement of similar parts, after the absorption of poisonous matter into the fingers of dissectors, from corrupting corpses, &c.

5th. Because, in abundance of instances, febrile maladies are followed by *mesenteric obstructions*, which, I suppose, are caused by the absorption of pestilential matter, either swallowed or generated in the intestines from putrefied animal food, &c. as it may happen now and then that infectious matter, in flowing through the lacteals, may inflame the glands through which it passes, and excite in them tumor and its consequences.

6th. Because the quality of the blood in persons dead of the complaints already enumerated, is different, in many respects, from that brought on by mere exclusion of vital air, as in breathing septous and inflammable gases; leading thus to a persuasion,
that,

that, besides the *withholding oxygene*, there had, in pestilential diseases, been actually an *addition of something septic* to the circulating mass.

7th. Because, in many distempers of the summer and autumn, the colour of the blood circulating through the skin, and the hue of the skin itself, are considerably altered; and in this change of the skin from the ordinary flesh-colour to clay-coloured, dusky, yellow, purple, and black, there is something of a peculiar cast in pestilential diseases, that is not found to accompany any others: the complexion of persons dying under water, and in fumes of burning charcoal, being in appearance, as well as in fact, considerably different.

8th. Moreover, I believe that pestilential matter is sometimes mingled with the circulating blood; because, though it has not been concentrated enough to produce, *in all instances, diseases*, when inserted by inoculation in the body of a healthy person; yet there are not wanting facts to evince its virulent influence in some experiments that have been made. (Home's Exp. on the Measles, &c.)

Lest this idea of the power of the absorbents to imbibe such fluids may appear to be merely speculative, it may not be amiss to mention the experiments of Maxwell (*Experiment. cum divers. Aërum speciebus in Animalibus, &c.*), proving the thing to be really a fact. This gentleman, among various other experiments, produced artificial emphysemata, by forcing atmospherical, phlogisticated (septous), dephlogisticated (oxygenous), fixed (carbonic acid), inflammable (hydrogenous), and nitrous (septic) airs into the cellular membrane of living dogs and rabbits. The result of numerous trials was, that elastic fluids so injected were very completely taken in by the lymphatics, though with different degrees of readiness; that all the

airs, except *two*, produced by absorption scarcely any observable effect upon the body; that these two were SEPTOUS and SEPTIC gases, the *former* of which would not destroy life until after some days, while the *latter* KILLED IMMEDIATELY. When the septic gas was injected, it was so suddenly absorbed, that death came on not by its inflammatory action upon the superficial muscles, but by its being mixed in a *certain quantity with the blood*, and after conversion to *septous* or *septic* (nitrous) acid, *by conjunction with oxygen in circulating through the lungs*, STIMULATING THE HEART TO DEATH, and utterly destroying *all* the irritability of that muscle (p. 12. & seq.). The experimenter computes, from the facts which presented themselves during his investigation, that this septic poison may be absorbed by the skin, and be conveyed to the heart in *about half a minute!* (p. 17.) Yet it must not be imagined that, after pestilential venom is inhaled into the blood-vessels, death will in all cases be the consequence. The offending matter may be carried from the body through the excretory outlets; or it may circulate a long time with the other fluids, and so *season both the vessels and the heart* to its action, that after a while *they*, like the *external parts*, will grow *insensible to its stimulus*, and *no longer have their motions disturbed by it*.

You will observe that I reject altogether the notion of *putridity*, as it is *very generally supposed* to be going on in the blood-vessels; and that I have no faith in the introduction of *putrid ferments* into the mass of fluids. A putrefactive process taking place in the contained parts of the living body, except among the contents of the alimentary canal, is incompatible with life more than a few minutes. Putrefaction is a resolution of an organic body into
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its elementary atoms, or into new compounds. Now, many of these are gases, whose extrication in the blood-vessels would extinguish life in a very short time. Besides, the fluids produced by putrefaction, having already undergone that operation, cannot be any more susceptible of it. They not only do not putrefy the muscles, but, in the common acceptation of the term, they retard putrefaction in other substances. Thus *fixed air*, *nitrous acid*, and *volatile alkali*, which are reckoned among the most active *products of putrefaction*, are known to be some of the most *powerful opposers of it*. And it may be laid down as a pretty broad fact, that such substances as are *septic in their origin*, are *antiseptic* in their effects; and this necessarily from the nature of things.

As to the *dark colour* of the blood drawn from the *veins*, in malignant diseases, and the *dissolved state* in which it appears, I consider them as having no manner of connexion with a putrefactive ferment within the vessels. It is very well known, (*Annales de Chimie*, tom. v. p. 266.) that hydrogen gas, injected into the jugular vein, keeps the blood liquid, and imparts to it a colour almost as black as ink; and it is as well known, that the hydrogen gas obtained from animal substances contains a quantity of carbone in solution; so that *venous blood* owes its *dark hue*, and its disposition to fluidity, to the commixture of a quantity of *carbonated hydrogen*. When vital air is freely admitted into the chest, and the lungs perform their functions well, the venous blood parts with its hydrogen and carbone, to form with the principle of acidity water and fixed air in the bronchia, and receives from the pulmonic cells a portion of oxygen in their stead. When therefore, by an impediment of the respiration, as in breathing pestilential

tial air, the hydrogen and carbone are imperfectly or not at all exhaled ; and, at the same time, very little or no oxygen is absorbed through the lungs, the *black or dark colour*, and *disordered appearance* of the blood, and particularly the *venous*, follows as a thing of course. And whenever afterwards the pestilential matter absorbed is added to such blood, the deviations of colour, consistence and other qualities from the healthy state, must be yet more considerable.

From a review of what has been stated in this letter, the probability of the following inferences will be apparent. 1. That the presence of carbonated hydrogen, and the absence of oxygen, will explain the common qualities of the venous blood. 2. That pestilential matter may impart to it a further change of qualities. 3. That pestilential matter does actually enter the mass of blood. 4. That the lacteals and lymphatics carry it there. 5. That the appearances of the blood are very much alike in all pestilential distempers, from agues to plagues. 6. That these phenomena are nearly analogous to those induced by the injection of septic and septic gases into the blood-vessels. 7. That from the similarity of effects in the cases when pestilential matter was absorbed, and where septic fluids were injected, the two classes of phenomena are referable to the same general cause.—Your's very, &c.

SAMUEL L. MITCHILL,

New York, August 1, 1796.

Illustrations of Mr. MITCHILL's Doctrine of the Operation of Pestilential Fluids upon the Human Body. In a Letter to SIMEON DE WITT, Esq. Surveyor-General of the United States.

THE perusal of your instructive letter, dated at Albany, June the 2d, 1796, on the subject of my pamphlet about pestilential airs, which you are polite enough to call "an ingenious and valuable work," has given me much pleasure. Availing yourself of the miscibility of contagion and infection with water, you propose steam or the *vapour-bath* as an additional means of removing it, and describe how the Indians apply and employ that remedy: I question very much, however, whether in pestilential complaints, occurring as they commonly do in North-America, in hot weather, it would unite so many good qualities as *clear cool water*. I do not remember that the *earth-bath* which you mention was ever medically prescribed for persons labouring under similar distempers; though I remember a queer fellow in Europe who used to recommend it very seriously to his patients and the public, and to bury himself up to his neck as an example for them; he used to say the application of fresh earth was admirably calculated to invigorate the body by extracting the causes of diseases, and to strengthen the mind by operating as a *memento mori*; its similitude to interment, I rather suspect, would make it operate unfavorably upon terrified persons, who think it is quite soon enough to be buried after they are dead. Such considerations as have occurred to me concerning some other matters mentioned in your letter, are contained

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in the papers which I read last winter before the Agricultural Society of New-York.

You express your "full persuasion, that, under certain combinations in our atmosphere, gaseous fluids are the causes frequently of the worst maladies that afflict us, whether received by the absorbing pores of the skin, by the lungs, or by the bowels." In this sentiment I fully agree with you. But as this conclusion ought to be admitted with some restriction, or requires certain explanatory considerations, I shall now present you with the result of my reflections on the limits by which their pernicious operation is circumscribed.

When we speak in common language of the unhealthy or destructive effects of contagious or infectious matter, we generally wish to be understood as referring to their operation on the bodies of those to whom it is applied fresh, or who never felt its influence before. Thus, when it is affirmed the small-pox is a dreadful distemper, the expression is limited to those who have not been seasoned to its action; when it is asserted that the plague is very easily caught, the meaning is, by those whose constitutions have always been wholly untouched by it; when it is declared the yellow fever cuts off multitudes of men in the tropical climates, the remark particularly refers to newcomers from the temperate zone, &c.

I have laid it down as a fact in my doctrine of fever, that the sick get well in abundance of instances, less by the aid of the medicines they swallow, than because the stimulus of infection wears itself out. The constitution in these cases becomes so habituated to the venom, that this no longer makes a sensible or morbid impression on it. After a servitude of greater or less duration or violence, it seems at length to get emancipated. By various
degrees

degrees of indurance, it acquires a sort of immunity from the old source of inquietude, and obtains a discharge as it were from further vexation on that score. It somehow becomes enabled to live and be useful in times of distress and danger, with little or no molestation from the ordinary cause of mischief. When pestilence summons the multitude, such persons enjoy their privilege, and are in the nature of exempts from its mandate.

Thus it appears to me there is a whole class of animal maladies which leave the system in a condition less liable than before to be incommoded anew by contagion or infection. Though I do not know that the human constitution can, *in any case*, acquire such a degree of apathy or inirritability as to be wholly and always free from successive attacks of these kinds of distempers, yet, in almost every one of them it experiences *something of such a tendency*. A citation of a few facts on this subject will at once elucidate the principle, and shew the analogy.

The small-pox, when invading in the natural way, leaves the constitution so little liable to be troubled by it a second time, that the art of inoculation has been contrived and practised, with the view to induce in the body, artificially, whenever it was thought proper, an insensibility to the further operation of that contagion. A like insensibility is brought on by the measles and varicella.

Syphylitic contagion, applied to the urethra, will frequently, after exciting a variety of uncomfortable symptoms there, lose its power of stimulating any more, or wear itself out (Hunter on the Venereal Disease); such persons as have had it once being, under equal circumstances, not so likely to take the contagion afresh.

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They who escaped the yellow fever which raged in Charleston in South-Carolina in 1748, were far less likely than before to be attacked by it (Lining, Essay Phys. Lit. vol. ii. p. 374.); and on this immunity from the distemper, the writer expresses himself with great confidence. The same remark has pretty generally been made by men of experience and observation between the tropics.

Small animals, who have been kept for pneumatic experiments, and frequently made to breathe non-respirable airs, grow by degrees so far familiarized to their action as to suffer far less inconvenience and risk than at first.

Prisoners in foul jails, like the natives of unhealthy countries, may become, by degrees, so accustomed to pestilential air, that their constitutions will not be greatly disordered by its presence; while, at the same time, a person from a pure atmosphere, suddenly introduced, may suffer violent disease, or be quite destroyed by it.

During a pestilence which, in the former part of the eighteenth century, raged almost throughout Europe among the horned cattle, the German farmers would give almost any price for cows that had once had the disease, because they were seldom or never seized again with the plague. (Van Swieten apud Boerhaav. § 587.)

If the person who is seized with a quartan, says Sydenham (Opera Universa. § 1. chap. 5. p. 49. 8vo. edit.), of whatever age or temperament he be, has been affected with a similar malady in any other period of his life, no matter how remote, this second invasion of the disease will not incommode him much, but will spontaneously leave him after a few fits.

Although patients are apt, from irregularity in diet and regimen, to *relapse* when in a state of

convalescence from the plague; yet P. Ruffel declares, that re-infections were always regarded as remarkably uncommon (Treatise on the Plague, B. 2. p. 190.); insomuch that out of four thousand and four hundred pestilential cases, he met with only twenty-eight of re-infection, well ascertained. And he affirms, that convalescents in plague are much less prone to *relapse* than in other malignant contagious fevers (p. 305.).

In all the conditions of the body now enumerated, you see there is a near and striking analogy; that is to say, by the application and continuance of any of the before-mentioned species of poison, the animal solids may be rendered so insensible of its action, as at last to be little incommoded by it, or ultimately to experience no inconvenience at all.

This unsusceptibility, thus induced, is the *τὸ θεῖον* of the ancients, the *divine something*, which brings the constitution safe out of the disease. Regardless of prescriptions and medical directions, the sick will get the better of their indisposition as soon as the pestilential cause loses its power of acting, and not sooner. While this accommodating process is going on, it is well known that fevers *cannot be cured*, and therefore the wisest physicians have carefully avoided too much interference, and have left the patient very much to *nature*, as they expressed themselves; meaning thereby, whenever the body grows insensible of the noxious stimulus the sick would be restored to health, and not until then.

It strikes me, this view of the subject enables us to comprehend the doctrine of what have been called CRITICAL DAYS. These have given rise to much dispute, and considerable labor has been bestowed to find out the true *judicatory periods*.
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In a mild or equable climate, where the constitutions of the people, their ways of living, the air they move in, &c. are very similar, it is conceivable that febrile paroxysms ought to exhibit considerable regularity, and assume certain times of departure, as well as of approach; and that therefore, the tertian period of the third, fifth, seventh, ninth, and eleventh, may in common have been the natural order in Greece and the islands of the Archipelago; and when the disorder was protracted beyond the eleventh day, the quartan period of the fourteenth, seventeenth, and twentieth, might have been the ordinary rule. The critical days become more distant and uncertain as the distemper is prolonged, until they are quite obliterated. The true meaning of the term *critical day*, then, is, not that the *αὐτοπαύσις* excerns or drives off something noxious that day, but simply, *that then the habit is established of being no longer susceptible of infectious stimulation.*

I can conceive likewise, that there may occur now and then, from special causes, an exception to this general rule, and that a distemper may terminate on the eighth, tenth, twelfth, fifteenth, sixteenth, or any other day which is usually *non-critical*.

In all infectious and contagious diseases, there is a certain course, which they will run, notwithstanding the administration of remedies; and when that course has been run, they may terminate without the aid of remedies. Does physic possess specifics of power sufficient to prevent the variolous matter from acting on the solids? No; the contagion of small-pox stimulates until it can stimulate no more, and then the sufferer recovers. In like manner the infection of pestilence will attack the body, and continue its attacks until an insensibility
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to its action is brought on, and afterwards the sickness will terminate. In both cases, the prudent physician knows the most and best he can do is to *conduct the sick in safety to the end of their malady*. None but the ignorant and presumptuous will pretend to be able to cure them. When, therefore, Hippocrates and Sydenham proceeded moderately with their patients, they acted with a degree of sense and consideration infinitely superior to those idle calumniators who have lately found fault with such feeble practice, and whose empirical rashness has led them wholly astray from the true principle of proceeding. Under the impression of such sentiments it probably was Lieutaud animadverted (*Precis de la Medicine*, p. 37.) upon the multiplicity of *remedies*, and Rammazzini lamented (*De abusu Chinæ Chinæ*) the *mischiefs done by Peruvian bark*.

The immunity which the constitution acquires under the varied forms of infection, will not in *all cases be equally lasting*; nor in *any* will it amount to an absolute security against a second attack. The plague *may* make a second onset; the small-pox has done the like. Such seems to be the operation of infected air.

However, if the principles herein-mentioned are right, a plain inference is, that there may exist a condition of body not merely able to escape infection, but capable of being actually benefited by its presence.

It has accordingly been remarked, that persons prone to consumption were not so likely as others to suffer from the infection of plagues in the unhealthy parts of Europe and Asia.

We are informed that the pestilential rice-grounds of Georgia exhale an effluvium of such a quality as to cause mortal remittents in the sound,
and

and at the same time affording signal relief to the phthysical.

There can be little doubt, that one principal benefit done to pulmonic ailments, by voyages to the South, proceeds from the impregnation of the atmosphere by infectious airs.

I hold it certain, there is always pestilential gas in and around the habitations of men, though it but rarely becomes sufficiently accumulated or concentrated to operate much in cool northern places. But the case is otherwise in the lower latitudes towards the equator, where it is common for so much non-respirable air to generate as to bring on the distresses of pestilence, while it keeps off the ravages of consumption.

It has been asserted that pestilential maladies chiefly affected the lower classes of people and the indigent. This indeed is very much the case. But people in the higher walks of life, physicians, princes, priests, and noblemen, have frequently fallen victims to their violence. (*Biblische Ergötzlichkeiten*, § 947.) So that the wealthy and the great have by no means an entire exemption. See *Misander's* *Über*. 2 Sam. xxiv.

But in seasons of pestilence, certain tribes of animals are exempted more completely than any description of men, particularly many of the species of reptiles and insects. It seems, that in the economy of nature, these, though many of them are breathing animals, do require an atmosphere different from that which suits the constitution of mankind and quadrupeds. They are bred in the midst of pestilential air, and thrive best in it.

On considering the history of modern endemic distempers, and comparing it with the relations made in the eighth, ninth, and tenth chapters of Exodus, the plagues of Pharaoh will be found to be

be very analogous, and to succeed each other in a very orderly progression. They are almost all local, and such as might be expected to happen in a valley of considerable width near floods of the Nile. The conversion of the river into blood will admit of the same explanation with supposed showers of blood; and the rain there, in the opinion of an agreeable writer, (Pott. *Essai sur la Nature*, &c. tom. i. ch. 8. p. 115.) may be coloured red during its descent by the dust washed from certain insects, by the presence of microscopical insects themselves, or by fluids emitted by the insects; or after its fall it may acquire its sanguine colour from oker or reddish earth brought down from the mountains. The excessive multiplication of *frogs*, *ticks* (lice), and all sorts of *flies* (gnats and musquitos) swarming about, starving and dying upon the land, were sufficient to contaminate the air, and generate pestilence among domestic animals, and to cause ulcers and burning pustules on the human species. I have endeavoured elsewhere to prove, that bitter cold in the atmosphere is to be explained upon the same general cause which produces pestilence. The occurrence there of hail and lightning (see my letter to Mr. *Valentin*) and subsequent darkness are all very natural, as well as the extraordinary production of grasshoppers (locusts), and the mortality among the young Egyptians (Calmet sur l'Exode, p. 65. & seq.). This coincidence of pestilence and hail is very remarkable, and is strictly conformable to philosophical truth.

There is another instance of exemption which occurs to me, and that is of the white people of Nantucket and Martha's Vineyard, when such sad mortality prevailed among the Indians in 1763. The Indians alone suffered from it in

these two islands. The account given of this pestilence by Mr. Oliver, in his letter to Mr. Mauduit, is very short and incomplete. From it, however, we learn, that the *Indians had been scantied in their allowance of corn*, which led them probably to the consumption of a greater quantity of fish for food: in this way the distemper might have arisen. We learn further, that the disease so produced was attended with *violent inflammatory fever, which carried them off in about five days*, resembling, in these respects, the endemic disorders of New-York and Philadelphia. And we learn further, that the *Indians chiefly lived and died by themselves*: whence it would be not at all difficult of explanation, why the white inhabitants, who had better food and lived in distinct parts of the islands, altogether escaped.

As your official situation puts it in your power to collect information with great advantage from the westward, I have to request you will ascertain for me the effects which the air of those nitre-grounds, mentioned by Mr. Secretary Pickering, in one of his reports, has upon animal bodies, and especially upon human constitutions. In so doing you will aid the cause of science, and greatly oblige your sincere friend,

SAMUEL L. MITCHILL.

New-York, June 14, 1796.

SIMEON DE WITTE, Esq.

E X T R A C T S

FROM A

DISSERTATION,

SHEWING IN WHAT MANNER

PESTILENTIAL VAPOURS

Acquire their *acid* Quality, and how this is neutralized
and destroyed by

A L K A L I E S.

By ADOLPH C. LENT, M. D.

*Facts tending to shew the Connection between the
Effluvia of putrefying Bodies, and malignant and
pestilential Diseases.*

FROM marsh exhalations and human effluvia, has it been believed, from the earliest ages of physic to the present time, that malignant and pestilential diseases derived their origin. Daily experience still confirms that it is in the neighbourhood of marshes, and all such places where vegetable and animal putrefaction takes place to any extent, that pestilential and other diseases of various grades and violence prevail. Epidemics, attended with carbuncles and buboes, which are denominated, in conjunction with the ordinary symptoms of what is called *jail* and *hospital* fever, the characteristics of the plague, down to the mildest intermittent, have appeared, and raged with extreme violence, occa-

F f 2

sioned

sioned by the exhalations from putrefying animal and vegetable substances*.

The numerous facts and observations of the most judicious writers shew, that there are few climates where instances have not occurred of malignant epidemic and endemic diseases, occasioned by an atmosphere furcharged and poisoned with the effluvia exhaled from certain putrid vegetable and animal substances. Bengal, on both sides the river Ganges, and Egypt, annually overflowed by the Nile, experience an unhealthy and pestilential atmosphere, immediately after the exhalations from the putrefying collections of vegetable and animal matter begin to arise in the air, and bring on diseases of various grades of malignancy, down to what is called the plague. The same occurs in every climate in a greater or less extent. In ponds, ditches, swamps, &c. where, after the evaporation of the water, the collections of vegetable and animal matter being left bare, and exposed to the influence of the sun, begin to putrefy, and emit certain gaseous exhalations, which transfuse themselves into the atmosphere, and produce diseases of an intermittent or more malignant type, proportionate to the concentrated state of the contagion, and other concomitant circumstances. Lind, whose testimony, from his experience, must equal most authors, relates abundance of instances where what is called *yellow fever*, and other malignant diseases, were caused by gaseous fluids exhaled from low and marshy places, exposed to the influence of a powerful sun. He observes, that "in all spots in the East Indies, situated near large swamps, or the muddy banks of rivers, or the foul

* Pringle on the Army, p. 321 and 322.

shores of the sea, the vapours exhaling from putrid stagnated water, from the corrupted vegetable, and other impurities, produce mortal diseases *." The same author more particularly mentions, that the *yellow fever* often raged at Greenwich Hospital in Jamaica, which, he observes, was built near a marsh, and could not proceed from any source of infection in the hospital. He every where attributes the *yellow fever* to the vapours arising from putrefying vegetable and animal substances.

Dr. Clark, in his "Observations on the Diseases of long Voyages to hot Countries †," mentions a *contagious malignant fever*, which prevailed at Prince's Island in 1771, produced from the exhalations of putrefying vegetable substances.

The plague which caused so great a terror and mortality in London in 1625 and 1636, according to the account given by Mr. Woodal, surgeon to St. Bartholomew's Hospital, and surgeon-general to the East-India Company, who was present those two years during its prevalence, was evidently generated in that city from the gaseous exhalations of putrid collections of animal and vegetable matter. He says, "the terrestrial causes (after mentioning it as a punishment inflicted on mankind for their sins) are, by common consent of most writers, as followeth; venomous and stinking vapours, arising from standing ponds, or pools, ditches, lakes, dunghills, sinks, channels, vaults, or the like; as also unclean slaughter-houses of beasts, dead carcases of men, as in time of war, and of stinking fish, fowl, or any thing that hath contained life and is putrid; as also, more particularly in great cities,

* Lind on Hot Climates, p. 85.

† Vol. i, p. 123 and 124.

as in London, the unclean keeping of houses, lanes, alleys, and streets: from those recited, and the like infectious venomous vapours, by warmth of the sun exhaled, are apt and able to infect the living bodies of men, and thereby to produce the plague, as experience too much sheweth *." From the description given by Mead †, of Grand Cairo, the supposed harbinger of a species of the worst type of disease, the plague, it will appear to be produced by similar causes with the above case, viz. by certain gases formed on the putrefaction of vegetable and animal substances, and suffered to arise into and poison the circumambient atmosphere with their noxious and stimulating qualities. He says, "It is situated in a sandy plain, at the foot of a mountain, which, by keeping off the winds that would refresh the air, makes the heat very stifling. Through the midst of it passes a canal, which is filled with water during the overflowing of the Nile, and, after the river is decreased, it gradually dries up. Into this canal the people throw all kinds of filth, carrion, &c. so that the stench arising from it and the mud together is insufferable. In this situation of things, the plague every year constantly preys upon the inhabitants, and is only stopped when the Nile, by overflowing, washes away the load of filth."

Pringle, Jackson, Hume, and a number of other authors, might be added in further proof, that the effluvia from animal and vegetable putrefaction may give rise to, and are the common causes of malignant and pestilential diseases. Instances, abundantly numerous, occur in our own territory,

* Monro on the Army, vol. i. note to p. 223.

† On the Plague, p. 29 and 30.

to confirm the noxious and pestilential influence of the products just named, on their application to the constitution, notwithstanding the (so named) *facts*, which were promised *speedily to appear* almost a year since, in contradiction of this opinion. It is related by Dr. Reynolds*, that from the putrefaction of a horse, which lay on the borders of a marshy piece of ground, a young woman who lived near, and was obliged frequently to pass and repass the putrid carcase, was affected with violent pains in the head, and sickness at her stomach. On the second day of attack she was bled; but her fever increased, and she became delirious. A number of blisters, surrounded by inflammation, appeared upon her feet and hands, fingers and toes; and she died the fourth day.

A case a few years since occurred in this city, where a severe attack of fever, of the remittent type, attended with petechiæ, made its appearance in two persons of the same family. On examination into the cause of these complaints, it was discovered, by the attending physician, to have originated from the blood and other offal of cattle, slaughtered in the yard belonging to the house, which was suffered to collect and putrefy; to the exhalations of which the two persons attacked had been, from time to time, exposed. An instance of a similar nature, which occurred to a practitioner of a neighbouring town, is related by Mr. Bayley, in his treatise on the epidemic of New York, in 1795†. “Some time in the month of September I was called to visit a young man about eighteen years old, in a family in the skirt of the (Hartford) town. He was violently attacked

* Webster's Collection, p. 197.

† P. 84 & seq.

with most of the characteristic symptoms of yellow fever, &c. The next day a second was taken in the same manner; and, on the morning of the third, three more were taken sick. This led me to suspect some particular cause. I searched for it in vain that time. The next morning, on passing through the kitchen, I smelt something that was very offensive, which none of the family had noticed. On opening the cellar-door, I found that it proceeded from the cellar. Two persons went down to examine, and found, in one corner of a small tight room, a quantity of June cabbages, on which the sun had shone about three hours in a day. They had rotted, and sunk down in a lump of putrefaction. They run a stick under them, and lifted them up, and there immediately issued such an intolerable stench, as obliged them instantly to leave the cellar. A vomiting was brought on at once, which lasted them nearly an hour. Notwithstanding that the doors and windows of the cellar were thrown open, it was two days before they could clear it out. No other person in the family was taken afterwards, and those who were already seized soon recovered."

The malignant epidemic, or yellow fever, which prevailed in the summer of 1797 in Providence, Rhode Island; in 1795, in Norfolk, Virginia*; and in 1791 in New York; evidently took their origin from gases exhaled from vegetable and animal substances, suffered to collect and putrefy, on exposure to a heated atmosphere. It would be endless and unnecessary to add facts in further confirmation of the noxious and deleterious qualities of certain gases, formed from vegetable and

* Webster's Collection, p. 148 & seq.

animal putrefaction, on its application to the constitution. Those already related, as well as various other instances, sufficiently confirm, that the greatest degree of vitiation which the atmosphere manifests by its operation upon the constitution, proceeds from the effluvia emitted from certain vegetable and animal substances during putrefaction. And as far as the innumerable facts on this subject have been collected and examined, there exists the most cogent evidence, that the products just named form infection, or contagion, marsh-miasmata, or human effluvia, or whatever other name has been affixed to it. What the precise nature of these exhalations, or cause of fevers, was, and which the particular noxious gas, though long a subject of inquiry, remained unknown, till within a few years, since Mitchill, Professor of Chemistry, Natural History, and Agriculture, &c. in Columbia College, engaged in an investigation of its properties, made known to the world what that poisonous something, which is formed during animal and certain vegetable putrefaction, was. He discovered it to be a portion of septon (azote), one of the elements of the body undergoing putrefaction, united chemically with more or less of oxygene (the acidifying principle), in the form of septic (nitric) oxyd and acid *. On the formation and presence of this compound, it is presumed, do pestilential and other malignant diseases depend. And in proportion as a greater or less quantity of the above compound is formed; in proportion to its sparse or concentrated state; in proportion to the length of time, the susceptibility of the constitution to be operated upon, and the circumstances

* *Vide* Mitchill on Contagion.

under which it is applied ; will the diseases, depending upon this cause, be more or less violent, and attended with various pestilential symptoms.

Inquiry into the History, Production, and Qualities, of that Acid which attends the Putrefaction of such Bodies as give rise to malignant and pestilential Diseases.

SEPTON, the base of the acid of putrefaction, or septic acid, is one of the most abundant elements in nature : it has not hitherto been subjected to any examination by itself, as no experiments have been able to detect it in a distinct and separate state. In combination with caloric (the matter of heat), it forms septicous (azotic) gas, which composes nearly three fourths of our atmosphere, and is the same species of air which living plants are supposed to exhale in the night, according to Ingenhouz *. It likewise constitutes one of the elementary principles of certain plants ; and, from the result of certain experiments made by Eagleton Smith, esq. appears to be one of the elements which compose animal poisons, as was, some time previous to this, presumed by Professor Mitchill. From the similar action on animals, of such animal poisons as were used by the experimenter, such as that of bees, ants, and some other insects, with the decoction of the poisonous plants, laurel, tobacco, digitalis, opium, &c. it appears highly probable, that their

* Experiences sur, &c. vol. ii. sect. 7.

deleterious qualities are owing to a modification of this same principle, viz. septon. It also enters largely into the composition of the muscular fibre, blood, and lean parts of animals, in combination with carbone, hydrogene, and phosphorus, which are united together by a certain portion of oxygene, forming animal oxyds and acids, in proportion to the degree of oxygenation. This gas, in its pure and distinct form, is incapable to support respiration and combustion, while it sustains the life of plants, which appear to possess the power of decomposing it, and to attach to themselves the septon, which enters into and constitutes one of their principles*. This principle or element is also capable of uniting with oxygene, the principle of acidity, forming with it, in proportion to the quantity of this last substance, 1. The gaseous oxyd of septon (dephlogistated nitrous air); 2. Septic (nitrous) gas; 3 and 4, Septous and septic (nitrous and nitric) acids; and 5, Septic acid gas.

1. In the first of these forms, that of the gaseous oxyd, in which the acidifying principle is so small as not to manifest the smallest degree of acidity, it is capable of supporting combustion, but is highly deleterious to the lives of animals, which it destroys the moment they are surrounded by an atmosphere of this kind†. 2 and 3, The next degree of combination of oxygene with septon, is the septic gas, and the septous acid. These are artificial productions, and never found to exist in the atmosphere for any considerable length of time, as their existence depends on being kept closed, and free from contact with the air. The rapidity with which

* Mitchill on Manures. Med. Repos. vol. i. No. 1.

† Priestley on Air, vol. ii. p. 35.

they absorb oxygene from the atmosphere, on exposure, is so great as to become quickly saturated with this principle, and turn to septic acid. As their existence in the air is only momentary, unless kept from coming in contact with it, they can have no material influence on man or brute animals; and their qualities are so widely different from those of the more highly oxygenated form, the experiments and conclusions drawn from the two former cannot apply to account for the phenomena of the latter. 4 and 5, The septic acid, which is still higher dosed with oxygene, and the septic acid gas, the highest degree of oxygenation of septon, the form in which these compounds most commonly exist, and which are produced wherever septon and oxygene come into chemical union, have, for a length of time, been considered of *mineral* origin, and classed among the acids of this kingdom. How far this opinion is founded in experience, and deduced from facts, will appear on examination of the materials and sources whence it is derived. It is well known that nitre consists of septic acid joined to pot-ash, and is usually formed during the decay of animal and such vegetable bodies as contain septon. And it is ascertained, that septon and oxygene enter into the composition of those substances, when alive, and have gone into new combinations, on their disengagement after death. One of these recent compounds must be septous and septic acid, constituting, by junction with a saline base, the septicite of pot-ash. The theory of saltpetre thus necessarily presumes the generation of septous and septic acid, from two of the elements disengaged from organic texture: and as septon, the radical of the acid, is especially abundant in animal bodies, there is little difficulty in comprehending both how, in such circumstances, it attracts the acidifying

acidifying principle, and afterwards attaches itself to the alkali. Nicholson observes it to be well known, that the septic acid, instead of existing in the mineral kingdom, is almost always produced by a concurrence of circumstances, chiefly consisting in the exposure of putrefying substances to the atmosphere; and that it is formed by the union of two principles, which are always found in atmospheric air, and the exhalations of putrefying substances *. The nitrous quality of the earths at the bottom of graves, in which animal disorganisation has taken place, is further testimony of the origin of this acid, as in this case it could not have acquired its septic quality from any other source. Hence may be understood how other earths, such as those of stables, cow-houses, cellars, vaults, drains, sinks; &c. &c. acquire their nitrous quality. During the putrefactive process of such vegetable bodies as contain septon, and animal matter, which abounds in this principle, the oxygene derived either from the corrupting bodies themselves, from the water in or near them, or from the atmosphere, unites with this principle, and forms the septic acid, which, being taken up by these earths, converts them into nitrous soils.

In further confirmation of the origin of this acid, may be added the authority of L'ourcroi, who says, "It is no longer to be doubted that the saltpetre, which forms itself under our eyes, in soils soaked by vegetable and animal juices, or in stones impregnated with the same juices, or their vapour, (the materials which compose the floors and walls of our stables, vaults, &c.) represent, in this respect, real artificial nitre-beds †."

* Nicholson's Chemistry, p. 32.

† *Vide* Med. Repos. vol. i. No. 1. p. 71.

This acid is also found to exist occasionally in the atmosphere. The experiments of Margraff † on snow and rain-water, and Bergman's analysis of waters, prove its presence in the air, whence they are precipitated by these bodies, and mix with them in their descent. The nitrous quality of the calcareous matter of old walls, which takes place to such an extent as to be converted to economical purposes, affords like proof of its presence in the atmosphere.

The bases of the two gases, septon and oxygene, which compose this acid, constitute likewise our atmosphere, but in different proportions and combinations. The septic acid is found to contain four parts of oxygene and one of septon, chemically united; while the proportion of these ingredients in atmospheric air about the mean ratio, are 27 of the former to 73 of the latter; not, however, chemically united, but only diffused through each other, as clay is diffused through water, or as motes are seen passing through sun-beams. These gaseous components of the atmosphere are intimately blended, and mixed together, but do not lose their attraction for caloric, by which they are continued in this state, and for which, in ordinary circumstances, they have a greater affinity separately than for each other. It is by virtue of this attraction for the matter of heat, that they are each kept in a state of gas, and not suffered to unite, and form septic acid, and thereby destroy the respirability of the atmosphere.

Dr. Beddoes remarks, that "the nice balance of attraction between the constituent parts of the

† *Phil. Watson's Chem. Essays*, vol. ii. p. 79.

atmosphere deserves notice. These two substances, when closely united, form nitrous (septous) acid; if, therefore, they were not, by some circumstances, prevented from uniting closely, all the oxygene, with part of the azote (septon), would be changed into a highly concentrated acid, and the waters of our globe would be converted into aquafortis" (septous acid)*. Fourcroy also observes, "that this (septic) acid is composed of the same elements with atmospheric air, only under a different form, and in different proportions, from those which constitute the atmosphere. These facts are indisputably established by experiments in which the nitric (septic) acid is decomposed, and again produced by the union of the original elements. Hence it is demonstrated, that it consists of four parts of oxygene, and one of azote (septon). But these two principles, as contributing to the formation of the atmosphere, are in the proportion of a little more than two parts and one half of the first, and one of the second, and exist in an uncombined state, separately dissolved in a common menstruum, and without the possibility of contracting a real chemical union. Hence it arises, that atmospheric air is never spontaneously converted into nitric (septic) acid †."

The formation of septic acid in the atmosphere seems, however, to take place under certain circumstances; as when the two constituent elements of the acid are brought into close union, and within the sphere of each other's attraction, by some violent concussions, such as lightning in

* Considerations on the Medicinal Use, and on the Productions, of Fætidious Airs, p. 18.

† Vide Med. Repos. vol. i. No. 1. p. 68 and 69.

thunder-storms. The experiments made by Mr. Cavendish*, who, by passing the electric spark through a portion of oxygenous and septic (azotic) gases, obtained this acid, further tends to corroborate this opinion, and leads, at least, to a belief, that this process, to a larger amount, is constantly taking place in the upper regions of our atmosphere, by the intervention of the electric matter.

Action of this Acid and its Oxyds upon Timber, Metals, Earths, alkaline Salts, and Water.

THE septic acid having been shewn, in the preceding pages, to owe its origin to animal and vegetable decomposition, its operation on timber, metals, &c. will next be considered.

Facts, sufficiently numerous, prove that this acid, generated by putrefaction, is always on or near the surface of the earth, and thence, when existing in any considerable quantity, pervades the atmosphere, and, on meeting with certain bodies, unites with them, and becomes fixed or decomposed. If, in its vaporific form, it meets with the woody portion of dwellings, around and in which it is more or less plentifully evolved, more especially the unclean, there can be no doubt but a quantity of this acid is imbibed, as all these materials are porous in a greater or less degree. There are no direct experiments, however, which

* Chapuis's Chem. vol. i. p. 219.

prove that there exists a chemical union between the acid and it; but, from the readiness with which wood is penetrated by water, and the known union which this latter body possesses for contagion, it must not unfrequently be conveyed in this manner, and combined with the timber of human habitations, where these gaseous vapours, extricated during vegetable and animal putrefaction, abound: the quantity taken up will, in all probability, be proportionate to the porosity of their texture; and in this ratio may the different kinds of wood be capable of imbibing the acid. The rapid decay and rotting of the timber of such vessels as carry wheat, is further testimony of the union and destructive operation of this acid, on its application to wood. The manner in which this process takes place, appears to be owing to the grain falling through the flooring of the vessel, where, on mixing with the water there commonly present, it putrefies.

Wheat, containing the principle of putrefaction in no small quantity, has, during its dissolution, this principle, united with a sufficiency of the oxygene, supplied either by the water, or what it itself contained, to form the septic acid, which, spreading itself, attaches and unites with the timber, causing it to rot and decay, more or less rapidly, in proportion to the strength and activity which the acid attains.

From this disposition of the acid of putrefaction to combine and unite with the woody portions of dwellings, ships, or whatever else it comes in contact with, may it happen, that the noxious matter, said, in some vessels, to infect each successive crew, derives its poison.

2. The operation of the septic acid, as above observed, in rotting and breaking down the timber of

vessels, has been noticed to rust and corrode, proportionally quick, such iron spikes and nails as were exposed, in a similar manner, to the same cause; and, from its corrosive qualities, gradually destroys and wears them away, if present in sufficient quantity, till nothing but rust is left remaining. Such instances as have been collected and examined on this subject, go to prove this operation of the acid on metals. It has been observed, that in the West-India Islands, where putrefaction goes on rapidly, such iron cannon as were exposed to the atmosphere, commonly surcharged more or less with this acid, rusted much sooner than those which had been buried in the sand in salt water. The testimony of Van Swieten also corroborates the activity and destructive influence of this acid on metallic bodies. He mentions, that at Oczakow, during the plague, "the instruments made use of by the surgeons turned as black and livid as if they had been dipped in aquafortis," (septous acid); and "the silver hilt of a sword, which, all the time of the plague, hung up in a tent, was changed quite black."

3. The action of this acid, in respect to earths, is more observed, and takes place to a larger extent. It readily unites with calcareous earth (lime), whenever they come within chemical attraction, in the form of a septite of the same, (calcareous nitre,) as appears from the nitrous quality of old walls of privies, sinks, drains, &c. Grounds frequently trodden by cattle, and impregnated with their excrements, the walls of slaughter-houses, and the like, where exhalations from putrid animal and vegetable substances abound, as well as the formation of nitrous earths at the bottom of graves in which animal bodies have decayed, puts it beyond

yond dispute, that these earths have an attraction for and unite with this acid. This affinity between the acid of putrefaction and lime, takes place to a greater or less extent in every habitation, more especially in large and crowded cities, where the strictest attention is not paid to remove all filth, and putrefying animal and vegetable materials. It was so well known, as to become an object worthy the attention of a body corporate in Paris, who obtained licence to take away as much of the old mortar of the walls of houses, torn down, as they pleased, for the express purpose of making nitre. Hence may be learned the quantities of septic poison that is present, and floats about the habitations of man, gradually undermining his constitution, and causing malignant diseases, if not taken out of circulation, and combined with some substance.

4. This acid likewise, on meeting with the carbonates of alkaline salts, decomposes them, by destroying the chemical affinity subsisting between them and the weaker acids; while, at the same time, it attaches to itself the alkaline basis, forming with it a septite of the same. The facts which have been already quoted put it beyond doubt, that the acid of putrefaction readily unites with pot-ash, soda, and ammonia, respectively, in the form of septites, wherever they come within the sphere of each other's attraction: and, if it be evident that these bodies enter into combination, there will be no difficulty to shew, that this acid likewise unites with such salts as have an alkali for their base. According to Bergman's tables of elective attractions, the septic (nitric) acid has a greater affinity for pot-ash than for any other alkali; and that no acid but the sulphuric will dissolve their

union *. On coming, therefore, in contact with such salts as have this alkali for their basis, it will decompose them, and, from its superior affinity for this latter substance, combine with it in the form of a septite of pot-ash. In the same manner will those salts, having soda and ammonia for their basis, be operated upon by this acid.

5. The presence of this acid in water, and its ready and entire miscibility with this body, is evident from the experiments made, with the utmost diligence and attention, by Bergman and other chemists, on rain and snow-water. The testimony of Lewis is further confirmation of this union between the two bodies. He observes, that "common waters, both atmospherical and subterraneous, contain a little of this acid in combination with it †;" and that among the substances commonly found in waters, is the "nitrous (septic) acid, combined with an alkali into nitre, or with some of the soluble earths into nitrous salts ‡." "The purest of the common waters is that of snow; and the saline matter of this kind of water is commonly of the nitrous kind, composed of the acid of nitre (septic acid), united with calcareous earth."

It is agreed upon by almost all observers, that the vapours from stagnant waters do seldom occa-

* Although the septic acid does not possess an attraction for either of the alkalies, in so eminent a degree as the sulphuric, according to Bergman's tables of elective attractions, yet, from his note, it appears it is capable to disengage the sulphuric acid, in some cases, partially, from its connection with alkalies, though not so rapid and entirely as either of the other acids.

† *Materia Medica*, vol. ii. p. 120.

‡ Vol. i. p. 118.

sion much mischief, as long as the mud and slime remain covered. The reason of this is obviously owing to the mud, while covered by the water, emitting its poison but slowly, which, as it arises to the surface, mixes with the incumbent water, and remains united with it, so that little or none escapes to taint the atmosphere. But at length, as evaporation goes on, and the water is nearly evaporated, these fluids, rarefied by heat, and becoming volatile, ascend into the atmosphere, and taint it with their noxious qualities, to the detriment of man and brute animals, who live and move in it. On this miscibility of septic, or acid of putrefaction, with water, no doubt, does it happen, that showers of rain, as observed by almost every writer on the diseases of hot climates, possess such beneficial and salutary effects. The rain, in its descent, meets with this acid, unites with it, and thus precipitates it again to the earth, leaving the atmosphere in a state freed from its poison. In the same manner may dews and fogs, in their descent, unite with this acid vapour; and to the gradual and slow precipitation of water from the air, falling through this infectious fluid, and carrying a portion of contagion along with it, does it happen, that the crews of vessels, sent on shore, and sleeping on or near the surface of the earth, in the open air, in such places where these pestilential vapours abound, are so commonly seized with diseases which destroy their lives. The natives of the East Indies are so well aware of the noxious qualities, at times, of rain water, which falls first in showers, that they are cautious how they expose themselves to it. As evidence of this atmospherical water containing something deleterious, it has been known to cause seal-leather to become mouldy and rotten in the space of forty-eight hours. The same was also observed to hap-

pen in our own city, in the time of the epidemic in 1795. Hunter also remarks, that exposure to rain is believed to be the cause of fevers in the island of Jamaica. The practice among Europeans at Constantinople, Grand Cairo, and other places where the plague rages, to cleanse all their goods, &c. they receive by means of water, is further corroboration that pestilential gas unites with water, inasmuch that these bodies, thus cleansed, are deprived of communicating any poison they had previously imbibed. To this miscibility of contagious fluids with water, may cold bathing, in malignant diseases, owe its beneficial and salutary effects—the poison which adhered to the skin and its pores being thereby conveyed off, and rendered harmless to the constitution.

From the preceding facts then, it may be concluded, that the septic acid, generated in all filthy and unclean dwellings, sinks, &c. on meeting with either of the substances above enumerated, unites with them, becomes fixed or decomposed, and is thus taken out of circulation. By this wise provision of Nature, the acid of putrefaction, which must be formed in no small quantity, considering the immense and incalculable mass of vegetable and animal matter which is continually undergoing disorganization, is arrested and restrained from assuming its corrosive, stimulant, and poisonous qualities, which it exerts on man and brute animals, when set loose in the atmosphere.

Effects produced by it upon the Constitution of Men, particularly the Mouth, Throat, Alimentary Canal, exterior and pulmonic Surface, Heart, Blood-Vessels, and Lymphatic System.

HAVING ascertained, as it is hoped, the cause of most endemic and epidemic diseases, the sources of their origin and formation, together with their affinities and action on different bodies; their effects on the living constitution shall next be considered.

1 and 2.—The effects of oxyds and acids of this sort, when applied to the living body, which, in some instances, may be completely surrounded by an atmosphere highly charged with these gaseous fluids, are inflammations or ulcerations, together with many other diseases of different kinds; and, if inspired in a concentrated state, may cause instantaneous death. On its application to the fauces and throat, from its caustic and corroding nature, it may inflame, and excite heat and distressing pain in the surrounding parts, and bring on apthæ, and erythematic affections of the pharynx and œsophagus, as is observed to happen under certain circumstances, where it is generated or present, from any other cause, in sufficient quantity. The experiments of Professor Mitchill *, in his course of lectures in 1796, on the tartar of the teeth, shews that this acid may be (and is occasionally present in the mouth) either formed from the remains of corrupt-

* *Vide* Mitchill's Letter to Thomas Charles Hope, M. D. in the New York Mag. for February 1797.

ing food, or taken in by inspiration with atmospheric air. This operation and effect, produced by the acid and its oxyd on the fauces and throat, is further confirmed by facts of diseases of these parts, induced by breathing air highly vitiated with pestilential effluvia. To this effect is the observation of Huxham, who remarks, that "for many months past we had scarce the slightest fever, but it was attended with fore-throat, apthæ, and some kind of cuticular eruption, and that too in pleuritic and pneumonic disorders; so greatly did the constitution of the air, &c. seem disposed to produce eruptions in all sorts of feverish indispositions*."

Robertson, in his remarks on the Monthly Review of the sick in July and May, also observes, that to the class of fever, the dysenteric belly-ache, and almost all the cough and fore-throat cases, should be added, because they originated, I had nearly said, from the same source; these different appearances depending on the habits or constitutions of the subjects infected†."

In the pestilential fever which prevailed at Winchester Hospital, many were seized with uneasiness of swallowing, and complained of a soreness of the throat‡. To this may be added the authority of Chisholm, who, in his account of an epidemic fever in Grenada, remarks, among other observations, that "some complained of a rawness, as it were, from the throat to the stomach;" or, as they expressed it, "a rawness and burning of their inwards§."

* On Fevers, p. 274.

† On Jail Fevers, p. 325.

‡ Smiyth on Jail Fever, p. 12.

§ Med. Com. for 1792, p. 267.

Hence then it will appear, that this volatile acid does occasionally enter the fauces, and extends its influence to the œsophagus, causing a greater or less degree of inflammation and uneasiness in the parts, according as the poison is in a more or less concentrated form, and to the length of time it is applied. The mucus which lubricates the parts, and is continually excreted in considerable quantities, more especially on the introduction of any extraneous body, may, in all probability, defend them from more repeated attacks of this acid, by uniting with and preventing its coming in contact with the parts.

3. The operation of this acid on the stomach and intestines appears more frequent than the above, and is productive of greater evils and fatality to the constitution. It may be either taken into the stomach by mixing with the saliva, and swallowed, or may be generated in the intestinal canal, on the putrefaction of some of those substances that are taken in for our nourishment. The opinions of the most respectable authorities countenance these modes of operation. The saliva and fluids of the mouth consist principally of water, and may therefore be supposed to possess an attraction for these contagious gases. The infection, thus finding its way into the mouth, will almost unavoidably get into the stomach during the deglutition of our food, or be conveyed there with our drink.

Balfour, in a treatise on Putrid Intestinal Remitting Fevers, ascribes the causes of these complaints to a putrid state of the *mucus lining the intestines*, which, being absorbed by the lacteal vessels, and carried into the blood, causes the febrile state. —“ This mucus receives the infection first by contagious

ragious matter taken into the stomach by means of the saliva *.”

To this may be added the authorities of Turner, Gardiner and Lind; the latter of whom says, that swallowing the spittle, in infected places, is justly deemed a means of sooner acquiring the taint; for which reason neither the nurses, nor any one else, should be suffered to eat in infected hospitals. “I am apt to think, that infection, from whatever impure fountain it is derived, does first discover itself by affecting the stomach and intestines †.”

Another mode in which the diseases depending on the septic acid are generated, is by the putrefaction of those substances taken into the stomach, from time to time, for our support. If it be evident that animal and vegetable matter, undergoing dissolution in the open air, give rise to the septic acid and its oxyds, is it not presumable, that this same compound will be formed, on the corruption of similar substances, in the *primæ viæ* of human bodies? It is necessary to the maintenance of life, that a proper quantity of food be taken into the stomach from time to time; and that the digestive organs perform their functions properly; for as the diet is principally of the animal kind, and consequently containing all the elements necessary to the formation of the septic compounds, it would undergo putrefaction in the intestinal canal, were it not prevented by the saliva, gastric liquor, pancreatic juice, and bile, which, mixing with it, dissolve and prepare it for the various purposes it is intended to answer. As long then as the stomach secretes its liquors in healthy and due

* Page 130.

† On Hot Climates, p. 65.

quantities,

quantities, will its contents be kept in utter impossibility of forming the septic poison. But when these preventatives are entirely suspended, or weakened, from debilitating causes, such as the too liberal use of spirituous liquors, excessive heat, fatigue, or from any other process by which its healthy functions are destroyed or impaired, then it is evident that the food will be liable to corrupt, and the products formed from these materials, within the stomach and intestines, similar to those which obtain without the body. A source of poisonous effluvia seems thus to exist in our bodies; and, from its stimulant qualities, the occurrence of nausea, burning pain, and excessive vomiting, together with other symptoms of gastritis, will not be difficult of explanation. To this cause, whether generated in the *primæ viæ*, or taken in from a vitiated atmosphere, when applied to the intestinal canal, are diarrhœas, dysenteries, and cholera morbus, diseases of the same genus, only differently modified, referable. The inflamed state of the stomach, duodenum, and lower parts of the intestinal canal, and the black gangrenous and mortified spots, are all owing to the operation of this acid, which, in some cases, may acquire a higher degree of malignancy than common, by uniting with a larger portion of oxygen. The coffee-coloured matter, commonly called *black vomit*, ejected in what are called *bilious remitting* fevers, seems to owe its colour to a mixture of this acid, as appears from its stimulant nature, noticed by dissection, with a quantity of bile and blood, which is poured out of such vessels as have their coats destroyed by this poison. That this is not a discharge of putrid bile, is evident from the experiments of Saunders, who observed, that so far from its becoming putrid, it was less liable to
undergo

undergo this process than any other of the animal fluids, and would even prevent the disorganization of such substances as were immersed in it*. Blood, mixed with bile, became putrid in three days; while no mark of putrefaction manifested itself in the bile till the sixth day†. Hence also it is evident, that putrid bile, which has been assigned as the cause of bilious fevers, has no agency in its production; for if the bile did, in reality, become putrid, this change must necessarily have previously taken place in the blood, in which state the animal must expire within a few moments after putrefaction takes place.

4. On the application of these pestilential fluids, which have been considered the causes of the diseases mentioned, to the bodies of men, which it may completely surround in some cases, is it presumed, are the various eruptions and petechiæ, so common in fevers of the worst type, to be explained; and not often to be referred to critical depositions of humours from the blood. These affections will put on different appearances and malignancy, in proportion to the concentrated state of the poison, the constitution, and parts to which it is applied. From the disposition of this acid to adhere to bed-clothes and bedding, of which there are innumerable instances, it will readily appear how these pestilential eruptions are produced, especially on those parts that are kept constantly covered, as the back, loins, &c. which are thus continually surrounded by an atmosphere of contagious vapours. The skin, thus beset by this fluid, whose particles seem to inhere in its pores,

* On the Liver, p. 130.

† Ibid. p. 110.

becomes inflamed, and puts on this morbid appearance. The yellow colour of the skin, in some cases of highly contagious diseases, seems to depend upon the same cause, and not to an absorption of bile, as has been supposed by writers on bilious remitting fevers. If these changes of colour in the skin were really owing to absorbed or to regurgitated bile, the colour of the urine in these cases ought to be deeply tinged with this fluid, and the fæces to put on an ash-coloured appearance, as in jaundice; but none of these appearances are observed to take place in the fevers where this pretended absorption is alleged. Beside, it is well known, that such parts of the skin to which this poison is artificially applied, will put on a yellow appearance, resembling that which is observed to take place in what is called *yellow fever*. It has been observed, that persons sick with this fever, which had been taken in the West-Indies, had that part of their eyes which was, in vision, exposed to atmospheric air, tinged with yellow; while the remainder of the eye retained its natural colour. In this case the eye could not have acquired this colour from an absorption of bile; which, if it had been the case, would also have been evident in other parts of the eye and body. Were it not, probably, for the perpetual supply of tears, which wash the eyes, and thus convey off any contagious fluids that may be applied, these appearances might oftener occur, as impressions would be quicker observed in this organ than on the skin.

5. This acid, in a vaporific form, does, no doubt, sometimes enter the trachea, with the air, in respiration, where it may inflame and destroy the parts with which it comes in contact; and, in
its

its passage to the lungs, if in a concentrated form, may occasion sudden death. In this manner may the sudden extinction of life, in persons exposed to the contagion of the plague as observed by Russel, be accounted for *. If this gaseous fluid be inspired in such a diluted state as not to occasion immediate death, it may cause catarrhal affections, anxiety, coma, suffocation, &c. depending on the sparse or concentrated form, and circumstances under which it is applied. When mixed with atmospheric air, and taken into the lungs, it will not serve the purposes of respiration, as but a small portion of vital air will be decomposed, owing to the large quantity of non-respirable air which is taken in. The heat of the body must thereby be lessened, and the contractions of the heart and arteries become more slow and feeble. In this way may the purple and blackish spots of persons dead of fever, occasioned by this acid and its oxyd, and the livid and dark colour of the skin, attended with coldness during life, be accounted for; the lungs not being able to restore to the system its usual and necessary supply of oxygene. Hæmorrhages, debility, and prostration of strength, together with want of cohesion in the solids, might all be explained upon the same principle, the muscles being deprived of their usual quantity of oxygene, and overcharged with septon.

6. If this acid be formed in the stomach and intestines, or taken in by the saliva, and applied to the mouth, fauces, cuticular and pulmonic surface, can it be supposed, that it should not be taken up by the absorbent vessels of the skin and pulmonic

* History of Aleppo, p. 232.

organs, or absorbed by the lacteals of the intestines, which are known, in some instances, even to take up some of the fæces, and carry it into the mass of blood? That something of a pestilential nature is conveyed into the blood, appears from the evident marks of pestilential infection, which children, born of mothers sick with the plague, bring along with them. Whether they acquired this taint immediately from the blood circulating through the umbilical cord, or from the *liquor amnii*, or both conjoined, is immaterial to our present purpose, as, in either manner, it goes to prove what has been said above. The acid sweats thrown out from the poisoned mass of blood, by means of the small exhalent arteries, in malignant and pestilential diseases, forming the matter of contagion, and adhering to the bed-clothes and linen, which, by its corrosive qualities, it destroys and rots; and, if excreted in any considerable quantity, so commonly relieves the patient; inasmuch as the volume of poison contained in the arterial system is thereby lessened; shews that the blood, in certain diseases, contains something of a noxious nature. The appearances also which blood, drawn in pestilential fevers, puts on, correspond with that in which septic gas had been artificially injected*. Blood, thus infected with this poison, taken up by the absorbent vessels, will be carried the round of circulation, and will continue to stimulate the heart and arteries, wearing out their excitability, and, consequently, bring on death, if the constitution be incapable of becoming habituated to its stimulus, or part, or whole,

* *Vide* Mitchill on the Effects of Contagion on the Heart, in the New-York Mag. for 1796.

of the stimulus be not subducted. If it be present in any great quantity, it may cause a sudden extinction of the vital principle, as is observed sometimes to happen in highly pestilential diseases.

7. The above-mentioned compounds, when absorbed by the lymphatics, may inflame them, and cause obstructions, indurations, and even suppuration, of those glands through which they pass, as is commonly observed to take place in the inguinal and axillary glands, in the plague, and other diseases produced by a pestilential state of the atmosphere, where it is absorbed in a highly concentrated form. Instances have occurred, where the lymphatics of the hand, on this extremity being wounded, in dissecting bodies, in which the septic acid appears already to be formed, were highly inflamed, and could be readily traced from the part where this fluid had been applied, in their course to the glands in the axilla, in which subsequent suppuration took place. Beside the affections of these glands, those of the mesentery will be liable to like maladies; and more frequently, as this deleterious fluid will be more frequently applied to them, by reason of its absorption from the intestines. The septic compounds, passing through the lacteals, will inflame them, and extend to the glands, in their way to the thoracic duct, and bring on an indurated or schirrous state: if it be absorbed in a highly concentrated state, it may also communicate its effects to the mesentery. When these glands become indurated or inflamed, the chyle will necessarily be obstructed totally, or in part, in its circulation through these glands; consequently the system will not receive a supply of nourishment equal to the quantity expended in performing its healthy functions. Hence the body must waste away, and the
disease

disease named marasmus be induced. The frequent dropical affections which follow long-continued intermittents, dysenteries, and other diseases of the same class, appear, in many instances, to be owing to obstructions of these glands, which do not allow a free passage to the lymph, which is therefore deposited in the different cavities and cellular texture of the body; and in proportion as the obstruction is more or less universal, will the disease be general or local.

Application of this Principle to explain the Prevention and Destruction of Infection, or Contagion, in Ships performing Quarantine, in Fairs, Hospitals, private Dwellings, in regulating the Police of Cities, in the Management of Lazarettos, &c.

HAVING shewn the operation of the septic acid, on its application to the constitution, we come next to consider its prevention and destruction in ships performing quarantine, &c. &c.

1. In such ships as have these noxious effluvia floating about, either derived from articles infected, or generated from the collection and putrefaction of such materials as contain septon, it will be proper, from the known affinity which subsists between these contagious vapours and calcareous earth (lime), to expose this substance to an atmosphere thus impregnated. White-washing between decks, and all such places as may admit of this practice, will therefore be the most advantageous method in which it can be applied, as a larger surface will

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thereby be exposed, and, consequently, a greater portion of the acid taken up and neutralized in a given time. Frequent repetitions of this practice will be necessary where the contagion is abundant, as the lime will become saturated with this principle, and incapable to attract and take out of circulation any more of the noxious compound. In such instances where these effluvia have, for any length of time, been present in vessels, it is more than probable, that from the capability existing between the two to unite, the timber of the latter may imbibe some of these vapours; and to this, as has been above remarked, may it be owing, that the successive crews of certain vessels are sometimes destroyed. To destroy this connection between these two bodies, as well as to prevent the future ascent of the gas, and thus again taint the circumambient atmosphere, a solution of the vegetable alkali (pot-ash) in water, which possesses the greatest known affinity for this fluid, will be a proper preventive. It will disengage the acid from its connection with the wood, in consequence of this superior attraction, and join with it itself. Frequent washing the apartments will likewise tend greatly to cleanse and carry off the noxious vapours; and will also, by being imbibed into the texture of the wood, set loose and convey away such poison as may remain. Ventilation must not be neglected: the contaminated atmosphere will thereby have part of its volume conveyed off, and a quantity of purer air admitted; thus rendering its stimulating quality less violent and active.

2. The same means recommended above for the destruction of these fluids in ships will apply to jails.—As white-washing the walls with lime can at all times and readily be done here, it ought, from

time to time, to be renewed ; the poisonous effluvia being thus constantly taken up, and rendered harmless. Washing the apartments with water or ley, which has a still greater affinity for these effluvia, will disengage the poison with which they so commonly become impregnated, to the injury of the health of the inhabitants of these places. In no one instance will it be more necessary to admit fresh air, than in these places. The pent-up vapours will, in a short time, acquire a high degree of malignancy, and cause difficulty of respiration, uneasiness about the precordia, and bring on other symptoms indicative of a vitiated state of the atmosphere.

3. The regulation of hospitals will be answered by the same means already noticed for jails and ships : but, from the specific gravity of this acid or its oxyd, it will occupy the lowermost parts of the rooms. “ Under an atmospheric pressure which supports the quicksilver in the barometer at 29.84 inches, and in a temperature of 54.5 of Fahrenheit, a cubic foot of azotic gas weighed one ounce, thirty grains and one half ; and of oxygenous gas, one ounce, one drachm, and fifty-one grains : it is presumable that a combination of the two, that is, thirty-seven parts of oxygene united to thirty-three of azote, would form a fluid of nearly the same weight with atmospheric air, or rather heavier ; and the probability of this would increase, by considering that a cubic foot of nitrous gas, which contains only thirty-one parts more of oxygene than the gaseous oxyd does, weighs one ounce, two drachms, and thirty-nine grains.” Hence, then, persons who lay on or near the floor, where this compound is present, will suffer more than those who walk through these places ; and for this reason also will the atmosphere on the second floor be

more respirable than that on the first, or lowest. Vent-holes, upon a level with the lowermost part of the room, may therefore more readily suffer the escape of these noxious compounds; and, in addition with those substances that take up and neutralize them quickly, restore the purity and respirability of the air.

4. The preventives already mentioned, particularly for ships, which may be considered as floating habitations of men, will also apply to the cleansing and purification of private dwellings. From what has been said on the affinity of lime with the septic acid, it will at first view appear how much more preferable and conducive to the health of the inhabitants such dwellings, which have their walls plaistered with this substance, will be, to those of gypsum (sulphate of lime), which is incapable to neutralize the acid. The common practice to prevent and destroy contagion in private dwellings, by means of alkalies dissolved in water, such as ley, &c. and lime, shews how much preferable this management and contrivance is to that of burning tar, coal, sulphur, &c. substances that possess no useful, but pernicious qualities, inasmuch as the pestilential matter resists the attractive powers of these substances.

5. In regulating the police of cities, it will at first view appear highly necessary, in order to prevent the formation of these noxious fluids, to remove all the materials, such as animal and certain vegetable substances, from which they are generated. In addition to the preventives enumerated for the prevention and destruction of contagion in jails, &c. planting trees along the streets, especially those which are, from situation, more liable to collections of gases of this kind, will be of service in decom-
pounding

pounding these fluids, as soon as formed, if in considerable quantities, and thus restore the air to its former state of respirability. “These very substances (putrefying bodies and street-manure), that cause so much mischief and terror in *cities*, are sought after with great avidity by farmers, who purchase them at a high price, and use them, with much advantage, to fertilize their fields. The beneficial and salutary effects of this practice in husbandry, makes it look as if nitrous acid and nitrous airs were good manures, and that vegetables had the power of decomposing them; that, in short, in the economy of plants, there is a process by which the septon and oxygene of these infectious fluids are separated; and while the former remains in the vegetable as a part of its nutriment, the surplufage of the latter, after forming gum, mucus, meal, &c. and other vegetable oxyds, flies off through the upper surface of the leaves, in company with heat and light, in the form of vital air.” (Vide Mitchill on the decomposition of contagious air by vegetation. New-York Mag. for 1797.)

The luxuriant growth of vegetables in the summer and autumn of 1795, in New-York, during the epidemic, makes it further evident, that vegetables decompose this noxious body, and thus act in a beneficial and salutary manner. Upon this principle in vegetables to destroy the chemical union between the ingredients of septous airs, may the dangerous consequences often attending the cutting down of woods in new and uncultivated countries, be accounted for. The exhalations from the swamps, morasses, &c. being set loose in greater quantity in the atmosphere, by the now more direct rays of the sun, without any adequate supply of other vegetable substance to arrest and decom-

pound them, they ascend, and pervade the air, carrying on their usual noxious and delcterious qualities, on meeting the bodies of men or brute creation.

6. The management of lazarettos may be conducted upon the same principle. From the known miscibility of contagion with water, and the short distance these fluids extend their influence over this body, as has been repeatedly observed by Lind, and others, the most proper and healthy situations for institutions of this kind are readily pointed out. And,

7. According to what has been said in the fifth chapter, concerning the production of contagious fluids in the stomach and intestinal tube, from animal and certain vegetable food, taken in from time to time, it will appear, that such substances as contain septon to any amount, such as lean and muscular animal substances, are improper ingredients in diet. Such articles then as contain none of this principle, ought to be selected as the most proper for nourishment in complaints occasioned by this acid. Fat or oily substances being of this class, and vegetables containing but little septon, ought to be the most beneficial and wholesome diet in malignant and pestilential diseases. This is authenticated by facts sufficiently numerous to put it beyond cavil.

The comparative health, in the West Indies, between the English, who indulge in the free use of animal food, and the French who, on the contrary, abstain from this kind of aliment, and live principally on vegetable food, shews that animal matter is not only improper, but is an injurious article in our diet, in all pestilential conditions of the atmosphere, or when malignant diseases prevail. The
same

same is observed to happen in Bengal, and other parts of the East Indies. The English, who live principally on animal and vegetable food, are far more liable to attacks of malignant diseases, and a greater number of them are carried off annually thereby, than of the Gentoos and Brahmans, who live on rice. Beside, it is well known how much less fatal the *yellow fever*, and other species of malignant diseases, are among the Negroes of the West Indies, and those of the Southern states, who live on vegetable food for the most part, than among the Whites of these places, who are under no necessity of abstaining from the use of animal food.

P O S T S C R I P T.

March 8th, 1799.

WE have just seen Dr. I. C. Smyth's new edition, with fresh reports from several navy surgeons, transmitted to the Doctor by the Commissioners of Sick and Wounded. We have no doubt but the Commissioners will be zealous to furnish the Doctor with evidence if it come within their power, for their opinion of fumigation is embarked with his. We have looked in vain for clear facts in this new arrangement, and we are sorry to see time and talents like those of Dr. Smyth so misapplied, in scrutinizing a subject where his own practice has availed him so little. Ten days at Winchester prison was a short space for a complete knowledge of infection and typhus-fever. We also think the practice in high life, where the Doctor's patients chiefly lie, can have afforded him but narrow experience. Contagion there produces other diseases. It is humble drudges in the profession, like myself, that must earn knowledge among ship-fevers.

The Doctor finishes as he began: he set out without any fixed principle to direct him, and he ends by giving negative facts instead of positive

sive ones. We are glad to see his correspondents still recommending cleanliness and ventilation; they are the only securities against the poisonous nitrous vapour.

We wish to rescue Mr. Moffat's name from the favourers of this *quackery*: under the article "Malignant Ulcer," Mr. Moffat, in a subsequent report, withdraws his former testimony.

This publication will probably be the last, that will venture to disseminate the use of lethalic vapours in the apartments of sick persons. Fumigation has had a long reign in the practice of physic: it hath slain its thousands and its tens of thousands. The late efforts which have been made to prove it the legitimate offspring of experimental philosophy, have accelerated its destruction. There is a rising generation of surgeons in the British navy, who are capable of wielding the principles of science; and they will never again suffer it to walk the earth. *Peace to its names!*

SINCE this volume was put to the press, the foreign journals have announced a translation of the "*Medicina Nautica*" into the German language, by Dr. C. Warner, at Jena in Saxony; and accompanied with a learned preface by the celebrated Professor Hufeland, of that university.

Before

Before the publication of our next volume, we hope to be able to obtain an English translation of that preface, to satisfy the curiosity of the contributors to this undertaking with respect to the value set upon our inquiries by these illustrious foreigners.

This intelligence we trust will be a fresh stimulus to the exertions of our friends; as it must be now proved to the world, that in despite of local prejudices, the service of the country has prospered in our hands, while these studies have contributed a large share of new facts to a science that has in view the relief of human misery. With such incitements, our labours cannot relax. The life of a professional man, thus divided between the active duties of station and a studious retirement, possesses an asylum and enjoyments which no external circumstances can assail;

What nothing earthly gives, or can destroy,
The soul's calm sunshine, and the heartfelt joy.

POPE.

END OF THE SECOND VOLUME.

1847

Received of the Hon. the Secretary of the
Treasury, the sum of \$1000
for the purchase of the
land of the late John
Smith, deceased, and
the same is hereby
acknowledged.

Witness my hand and
the seal of the said
Secretary, at the
City of New York,
this 1st day of
January, 1847.

John Smith, Secretary of the Treasury.

1848

Received of the Hon. the Secretary of the
Treasury, the sum of \$1000
for the purchase of the
land of the late John
Smith, deceased, and
the same is hereby
acknowledged.

Witness my hand and
the seal of the said
Secretary, at the
City of New York,
this 1st day of
January, 1848.

John Smith, Secretary of the Treasury.



